ISSUED BI-MONTHLY VOL. XLVI., No. 1.

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OF

OPHTHALMOLOGY

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BY

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OF NEW YORK

AND

DR. C. HESS
OF MUNICH

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DR. W. A. HOLDEN
OF NEW YORK

JANUARY

NEW YORK
G. P. PUTNAM'S SONS, 2, 4, & 6 WEST 45TH STREET
AND NEW ROCHELLE, N. Y.
LONDON: 24 BEDFORD STREET, STRAND
WIESBADEN: J. F. BERGMANN'S Verlag
PARIS: J. B. BAILLIÈRE, 19 Rue Hautefeuille
1917
Price, per Number, $1.00 (4s. 6d.); per Year, $3.00 (£1.1.0)
Entered at the Post-Office, New Rochelle, N. Y., as Second-Class Mail Matter

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EDITORIAL NOTICE.

The Archives of Ophthalmology is a bi-monthly journal, published in annual volumes of about six hundred pages each, extensively illustrated with cuts in the text, half-tone text plates, and lithographic plates, many in colors.

About three quarters of the space is devoted to original papers, and the remaining quarter to a systematic report on the progress of ophthalmology, and to reports of societies, book reviews, and miscellaneous notes, all of it original.

The papers and reports are original, and only accepted with the understanding that they are to be published in this journal exclusively. The original papers in the English edition appear in the German (*Archiv für Augenheilkunde*) either in full or in more or less abridged translations, and *vice versa*. Any subscriber who wishes to refer to the original text of a translated or abridged paper may, by applying to the editors, obtain a reprint which he is expected to return after perusal. The subscription price of the ARCHIVES OF OPHTHALMOLOGY is $5.00 per year payable in advance. The price per number is $1.00.

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ARCHIVES OF OPHTHALMOLOGY.

THE PRESENT STATUS OF THE SCLEROCORNEAL TREPHINE OPERATION FOR THE RELIEF OF GLAUCOMA.[1]

BY DR. WALTER R. PARKER, DETROIT, MICHIGAN.

I SHALL open the discussion on the subject of the present status of the sclerocorneal trephine operation for the relief of glaucoma, by presenting some of the more interesting deductions from a comparison of results obtained in seventy-one trephine operations, and forty-seven iridectomy operations.

In the compilation of the tables every case operated on since the series began has been included. The symptoms or conditions of the eyes that determined which operation was to be performed in a given case were in general as follows:

All blind eyes, and all eyes with useful vision when the fields were not extremely contracted, were subjected to an iridectomy if the anterior chamber were of sufficient depth to permit of its easy performance. In all other cases, except the hemorrhagic type which with one exception was not operated upon, a trephine operation was performed.

All the trephine operations were performed after the technic suggested by Colonel Elliot, excepting that a complete iridectomy was performed whenever possible. A 1½*mm.*

[1] Read by invitation before the Clinical Surgical Congress, Philadelphia, October 24, 1916.

The cases here reported are all from the Ophthalmic Clinic of the University of Michigan. I am indebted to Dr. Avery D. Pranger, Assistant in Ophthalmology, for assistance in compiling these records.

opening was made in all but a few of the cases, when a *2mm.* trephine was employed.

The final test of any procedure for the relief of glaucoma must include its remote effect on the tension and integrity of the globe, and on its physiologic function. The result in the individual case depends on the type and stage of the disease at the time of treatment. As the majority of the cases here reported were subjected to operation after the vision had become seriously impaired or lost, comparison can be made only as to the effect of the operation on the tension and integrity of the globe.

FREQUENCY OF IRITIS.

The comparative results as regards the frequency of iritis following the various methods of treatment of the iris in the cases trephined perhaps is of sufficient interest to be presented.

TABLE I.

NUMBER AND TYPES OF CASES, TOGETHER WITH THE RESULTS OBTAINED IN EACH TYPE OF GLAUCOMA

	No.	Good	Percent.	Poor	Failure
Acute	1				1
Simple	41	31	75.6	3	7
Chr. Inflam.	14	6	42.9	2	6
Secondary to Cat. Ext.	3			1	2
Secondary to Luxated Lens	4	2			2
Secondary to Traumatism	2	1			1
Secondary to Uveitis	5	1			4
Hemorrhagic	1				1
Buphthalmos	2				2
Total	73	41		6	26
Simple	41	31	75.6	3	7
Other Types	32	10	31.9	3	19

A previous iridectomy was performed in 11 cases, a complete in 31, a partial in 15, and the iris left intact in 16. In the 11 cases in which a previous iridectomy had been performed, iritis followed in 18.1%. In the 31 cases in which a complete iridectomy was performed, iritis followed in 16.1%. In the 15 cases in which a partial iridectomy was performed, iritis followed in 46.6%. In the 16 cases in which the iris was left intact, iritis followed in 50%.

Comparing the total number of cases in which a previous or complete iridectomy was done, with those in which a partial or no iridectomy was performed, the results were as follows:

In the 42 cases in which a complete or previous iridectomy was performed, iritis followed in 16.6% of the cases, while in the 31 cases in which a partial or no iridectomy was performed, iritis followed in 49.6%.

CLASSIFICATION OF RESULTS.

The results were classified as *good* when the tension was reduced to between 5 and 25*mm*., and the structures left in such a condition that vision could be made possible if the eye were functionating.

As *poor* when the tension was materially reduced but not to normal, or if reduced, complications arose which resulted in changes that would have impaired vision.

As *failure* if the tension was not materially reduced, or if below 5*mm*. Also if complications developed which would have prevented the restoration or preservation of vision.

SCLEROCORNEAL TREPHINE OPERATIONS.

The 73 cases on which the trephine operation was performed together with results were classified as follows:

TABLE II.

CLASSIFICATION WITH REFERENCE TO THE PRESENCE OR ABSENCE OF IRITIS IN THE DIFFERENT METHODS OF TREATMENT OF THE IRIS.

Character of Iridectomy	No.	Iritis	Percent.	No Iritis	Percent.	Previous Iritis	Not Stated
Complete Previous Iridectomy	31	5	16.1	26	83.9		
Partial Iridectomy	11	2	18.1	9	81.8		
Without Iridectomy	15	7	46.6	8	53.3		
	16	8	50.	4	25.0	3	1
Total	73	22		47		3	1
Complete or Previous Iridectomy	42	7	16.6				
Partial and without Iridectomy	31	15	49.6				

From these figures, it would appear that the sclerocorneal trephine operation for the relief of glaucoma was indicated in the simple cases as compared with all other types of the disease in the proportion of 75.6 to 31.9 and a previous or complete iridectomy as compared to a partial or no iridectomy in the proportions of 49.5 to 16.6.

The immediate results were better in the simple cases as compared with those of the chronic inflammatory type in the proportions of 75.6 to 42.6 and as compared to those in all types in the proportions of 75.6 to 31.9.

REMOTE RESULTS.

In order to determine the remote results of the trephine operation, observations were made when possible on cases in which the operation had been performed at least one year previously. Eighteen such observations were made. The minimum period of time that elapsed between the operation and this last observation was one year less eight days,—the maximum three years and six months.

The results in these eighteen cases originally recorded as good remained so in thirteen and were changed to failure in five. All of the cases in which the remote results remained *good* were of the chronic non-inflammatory type of the disease. Of the five failures, three were of the simple type, one of the chronic inflammatory type, and one secondary to a trauma with luxation of the lens.

Examination of the histories of the cases of failure of the simple type revealed: one case, tension too low to be registered, conjunctiva over the site of the trephine opening fistulous, anterior chamber empty; one, the tension 10*mm.*, conjunctiva over the opening very thin, complete posterior synechia; and one, eye inflamed and painful. The last report was made by letter and details were not obtainable.

In the chronic inflammatory case, the eye was congested, tension too low to be recorded, conjunctiva thin, chamber obliterated, complete posterior synechia.

In the traumatic case, the eye was congested, tension 37*mm.*

No one of the cases was seen in an active stage of an infective process, but it is possible that three of them might be instances of late infection.

Of these eighteen cases, the remote records show 27.8% originally recorded as *good*, changed to *failure*. Of this number 17.2 % were of the simple type of the disease.

If this proportion of failures held throughout the series, the original 31 of the cases of simple type reported as *good*, would be changed to 25, and the percentage of good results in simple glaucoma from 75.6 to 60.9.

How different these results would have been, if the effect of the operation on the vision had been a factor in their classification, I am unable to say. But when we remember that practically all these cases were unfit for iridectomy, a procedure that results, as the trephine operation did in this series, in a reduction of tension without disturbance of the integrity of the globe in 60.9 % of the cases operated certainly commands our attention and careful consideration.

IRIDECTOMY.

The results obtained in the various types of glaucoma from iridectomy were as follows:

TABLE III.

Type	No.	Good	Percent.	Failures	Not recorded
Acute	3	1		1	1
Simple	19	13	72.2	5	1
Chr. Inflam.	9	6	75.	2	1
Secondary Iridocyclitis	7	4		3	
Secondary Uveitis	2	1		1	
Secondary Luxated Lens	1	1			
Buphthalmos	6	4		2	
Total	47	30		14	3

Results in simple cases 72.2
" " all other forms 65.3

It is to be remembered that these cases were all selected as being best suited for the operation of iridectomy, the main feature in the choice being the condition of the anterior chamber, and the exclusion of late cases in which there was a marked contraction of the visual fields.

Unfortunately the remote results in this series were obtained in only 6 cases: one, 3 yrs.; one, 3 mos.; two, 2 mos.—all good.

Through an oversight the "follow-up" letters were sent only to trephined cases. In this respect the report is incomplete.

A comparison of the recent results obtained in the cases that were trephined and those subjected to the iridectomy operation follows:

TABLE IV.

TABLE OF COMPARATIVE RESULTS.

Type	Iridectomy No.	Iridectomy Percent. of good results	Trephine No.	Trephine Percent. of good results	Result not recorded
Simple	19	72.2	41	75.6	
Chronic Inflam.	9	75.	14	42.8	1
All Types, except Simple	28	65.3	32	31.9	

While the early results obtained in the two procedures were much the same, in the simple cases being in round numbers 72 % from the iridectomy and 75 % from the trephine operation, those obtained in the chronic inflammatory type were better in the ratio of 63 to 31 % when the operation for iridectomy was performed.

I wish also to present the results in six cases trephined for the relief of increased tension after an iridectomy had failed.

No. of cases	Results	
	Good	Failure
6	5	1

If the trephine operation can be successful after an iridectomy had failed, as when performed as the initial operation, an important advance, it seems to me, has been made in the treatment of glaucoma. I hope the further discussion will elaborate this point.

DISCUSSION.

From the results obtained in this series it would appear that a practical procedure in the operative treatment of glaucoma would be to select the procedure best suited for the individual case rather than to subject all stages of all types of the disease to the same operation.

I have never compiled my results from iridectomy before,

and am surprised, as I am sure you are, at the high percentage of good results obtained. If 50 % of the selected cases of simple glaucoma can be relieved by iridectomy and 50 % of the remaining cases by trephine operation, the results of 75 % good would be better than most operators have been able to obtain.

If further investigation should confirm the suggestion here made, the deep iridectomy will be the operation of choice not only in the inflammatory cases, but in selected cases of simple type, reserving the trephine operation for those cases in which the iridectomy is contraindicated or, having been performed, has failed to relieve the tension.

OCULAR ANAPHYLAXIS.

II. A CONTRIBUTION TO THE ANAPHYLACTIC THEORY OF SYMPATHETIC OPHTHALMIA.

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THE total inadequacy of the older ciliary nerve theory and the failure of many observers to confirm the specific bacterial findings of Deutschman, have left the pathogenesis of sympathetic ophthalmia still unsolved. The mycotic theory, first advocated strongly by Roemer (1), which assumed that the inflammation in the sympathizing eye is metastatic in origin, has, it must be admitted, met with some confirmation in the later anatomical researches of Fuchs (2). This theory, however, while a logical explanation for sympathetic ophthalmia as a result of bacterial infection, fails utterly to explain the sympathetic ophthalmia resulting from non-infectious disorders in the exciting eye. Even though the sympathetic inflammations, following various conditions in the exciting eye, as intraocular trauma, subconjunctival scleral rupture, and degenerating intraocular sarcoma, be put in a separate class, the mycotic theory is still open to some objections. It assumes the occurrence at some time during the disease in the exciting eye of a septicemia, of which we have little clinical proof, and furthermore, the theory assumes a striking elective affinity on the part of the exciting organism, a fact that many leading pathologists and bacteriologists, despite the work of Rosenow, are still loath to admit.

In contrast to theories assuming a bacterial origin for the disease in the sympathizing eye, two chief theories have been

advanced. The first is the cytotoxic theory of Golowin (3). This theory assumes that the degenerating cells in the exciting eye cause the formation of an auto-cytotoxin which is specific for uveal cells. This cytotoxin is thought to be carried by the blood stream to the sympathizing eye, where it sets up a uveitis. Golowin prepared anti-serum, which should theoretically contain this cytotoxin. Intraocular injection of this serum into animals of different species produced a severe iridocyclitis. As a result of intravenous injection Golowin thought slight microscopic changes could be observed in the ciliary epithelium. This theory has, however, received no confirmation. At present the chief theory, in opposition to the mycotic origin of sympathetic ophthalmia, is that of Elschnig, who assumes sympathetic ophthalmia to be an anaphylactic uveitis.

In a series of papers (4), the first of which appeared in 1910, Elschnig enunciates his theory of the anaphylactic origin of sympathetic ophthalmia and reports his experimental work. Elschnig believed that the disintegrating uvea, or some portion thereof, in the exciting eye, is reabsorbed as antigen, and leads to a hypersensitiveness of the animal, and especially of the homologous tissue, the uvea of the second eye. Further absorption of this disintegrating uvea (or some constituent thereof) leads to an intoxication of the sensitized uvea of the second eye, which manifests itself clinically as a uveal inflammation.

Improbable as this theory appears at first glance, it nevertheless readily explains several important clinical facts. In the first place, it explains sympathetic inflammations, irrespective of whether the disorder in the exciting eye is bacterial or otherwise, and in the second place, it satisfactorily explains the latent period elapsing between the onset of disease in the exciting eye, and the outbreak in the sympathizing eye. This period, usually from two to six weeks, is the period after sensitization, in which the experimental animal develops the greatest sensitiveness.

While it is definitely proved that the entire organism can be sensitized by antigen absorbed from the eye, this theory, however, assumes several fundamental points which have not been definitely established. In the first place, it assumes that the uvea, or some constituent part, can act as a foreign protein to

the homologous animal, and furthermore, that the uvea, acting as a foreign protein, possesses a distinct organ specificity,[1] While it had been long known that such protein as that of the lens possesses the power of acting as a foreign protein to the homologous animal and possesses a distinct organ specificity, it has been thought that lens protein was the exception, in this respect. It was in the hope of establishing such properties for uveal tissue also, that Elschnig and other investigators undertook their various experiments.

Elschnig first attempted to determine the quantitive production of immune bodies following injection into the vitreous of the eye. Using cholera vibrio extract as antigen and the hæmolytic titer as his index, he found that primary intraocular injection gave but a slight production of immune bodies, while a second injection, ten days later, gave rise to a great increase in the immune bodies. This he believed due to the fact that the first injection was in an undisturbed eye, while the second injection was in a medium greatly disturbed by inflammation, so allowing a greater absorption of antigen. Turning his attention then to uveal tissue, he sensitized guinea-pigs to rabbits' uveal emulsion, and on reinjection observed general symptoms of hypersensitiveness and anaphylaxis, thus establishing heterologous sensitization. He then sought to determine three fundamental points, without the establishment of which the anaphylactic theory of sympathetic ophthalmia must fall. I. Does uveal tissue possess antigenic properties in the homologous animal? II. If so, what are the properties of the resulting immune bodies as to species and organ specificity? III. What constituents of uveal tissue are responsible for the antigenic property?

In order to determine these points he made use of complement fixation to determine antibody production following the injection of homologous uvea. He first determined affirmatively that antibody production followed such injection. In answer to the second question, however, he found that these antibodies were not specific for uveal tissue—that is, that some fixation of complement occurred when homologous liver and other homologous protein were used as antigen. Complete (100 per cent.) fixation, however, was obtained only with the use of uveal emulsion as antigen. Furthermore, using heterologous uveal

[1] Throughout the paper, in all references to organ specificity, the uvea is regarded as an organ.

emulsions as antigens with the complement fixation technic he constantly obtained partial fixation with the serum of animals sensitized to homologous uvea and was forced to conclude that the immune bodies produced had only a slight species specificity. Elschnig then isolated the pigment, chemically pure, of the uveal tract, and found, using this as antigen, that it gave fixation of complement with the anti-uveal serum. Finally, by the injection of this pigment isolated from homologous uvea, he obtained an anti-pigment serum, which gave complete fixation of complement when homologous pigment was used as antigen. This anti-pigment serum, however, gave partial fixation with heterologous uveal pigment. Elschnig concluded that homologous uveal pigment could act as antigen to the animal, and that this pigment was absolutely organ specific, but only relatively species specific. Further experiments by Elschnig led him to the conclusion that the pigment of the uvea could evoke a greater immune body response than could whole uveal emulsion. In 1911, with the collaboration of Salus (5), using complement fixation technic he reported still more evidence in support of the organ specificity and lack of species specificity of the chemically pure pigment.

These striking observations of Elschnig did not long go unchallenged, and subsequent observers repeated and elaborated this work with varying results.

Weichardt, and Kummel (6), in 1911, immunized rabbits to cows' uveal emulsion, and by means of the epiphanin reaction showed a strong organ specificity in the resulting anti-uvea serum. Kummel (7), then attempted to determine the presence of uveal antibodies in the serum of patients suffering with sympathetic ophthalmia, using as his method the epiphanin reaction. Out of thirteen cases of sympathetic ophthalmia, he succeeded by this method, in demonstrating uveal antibodies in seven, thirty controls being negative. Using this method he found that the uveal antibody content in the serum of the positive cases varied from day to day. In 1913 (8), with the complement fixation method, using as antigen the acetone extract of 20 per cent. uveal emulsion in glycerine, Kummel obtained positive results in 30 per cent. of cases suffering with sympathetic ophthalmia. Wissman (9), in 1911, in admirably controlled experiments, sensitized guinea-pigs passively by the injection of serum of patients suffering with sympathetic ophthalmia, and by subsequent intravenous injection of emulsion of the enucleated diseased eye of the same patient, obtained classical anaphylaxis. With the serum of patients suffering with sympathetic ophthalmia, he obtained in two cases a positive precipitin reac-

tion using both the exciting and a normal eye as antigen. Using diseased and normal eye emulsions as antigens in complement fixation technic Wissman failed, however, to obtain positive results. Rados (10), in 1913, immunized rabbits to homologous choroid and cornea, and demonstrated isoantibodies in the rabbits' sera. These antibodies, however, showed neither organ nor species specificity, supposedly antichoroid sera giving complement fixation with choroid, cornea, and kidney emulsion antigens. Neither could any species specificity be demonstrated for these sera. Rados therefore, on these grounds, attacked the anaphylactic theory. Elschnig (11) answered this criticism by pointing out that he had early shown that immunization with whole uvea gave rise to antibodies, not wholly organ specific, and that only by immunization with chemically pure pigment could absolute organ specific antibodies be produced. Species specificity he stated was never demonstrated, either with whole uvea or chemically pure pigment. Fuchs and Meller (12), in 1914, reported their experiments on ocular anaphylaxis. These observers emphasized the anatomical discrepancy between the lesions of sympathetic ophthalmia and those produced by experimental ocular anaphylaxis. Furthermore, in no case of sympathetic ophthalmia, either by the precipitin reaction or by complement fixation, even when the enucleated diseased eye was used as antigen (methyl and ethyl alcohol extract), could they demonstrate either uveal or ocular antibodies. Von Szily (13), in 1914, pointed out the attractiveness of the anaphylactic theory of sympathetic ophthalmia and collected much valuable evidence on ocular anaphylaxis in support of this theory. In later work (14), however, he questions the antigen properties of chemically pure uveal pigment, having failed to obtain any anaphylactic symptoms by sensitization and reinjection with either homologous or heterologous uveal pigment.

In this relatively unsatisfactory state the knowledge on this subject remains. The fundamental work of many observers on ocular anaphylaxis, combined with the striking observations of Elschnig and Kummel, gives an experimental basis to the anaphylactic theory which cannot be disregarded. On the other hand, the failure of some observers to substantiate these results, either in whole or in part, make the final acceptance of this theory as yet impossible.

It was with the hope of casting some new light on this subject that the work here presented was undertaken.

The central idea of our work has been to simulate as closely

as possible the conditions under which sympathetic ophthalmia occurs clinically, and to this end the eyes of sensitized animals have been perfused with specific antigen. This was done on the hypothesis that sensitization of the eye must be part of a general sensitization, and that intoxication, however it may be manifested clinically, must be through a vascular system. Preliminary experiments which we have already reported (15) demonstrated that the eyes of animals sensitized by intraperitoneal injection respond to perfusion with specific antigen by a primary contraction of the pupil, followed usually by a further gradual contraction, and by the occurrence of small hemorrhages throughout the fundus. At the same time it was shown that heterologous uveal emulsion possesses antigenic property equal to that of horse serum.

Having therefore demonstrated these two points (1) that a generally sensitized animal reacts locally on perfusion of the eyes with specific antigen, and (2) that this sensitization and intoxication may be brought about by heterologous uvea. It is necessary in order to establish more firmly the anaphylactic theory of sympathetic ophthalmia, to further prove the following points. I. That an animal may be sensitized by homologous uvea and that local intoxication may result from perfusion of the eyes with this antigen. II. That after sensitization by means of absorption following intraocular injection of one eye, the second eye will react on perfusion with this same antigen. Incidental to point I, in order that a proper scientific basis for the theory may be established, the question of organ specificity must be determined.

The plan of work has therefore been to determine the following points:

I. The antigenic properties of homologous uvea—organ specificity.

II. The ability of one eye to react to perfusion in animals previously sensitized by intraocular injection of the other eye.

III. What constituent of the uveal tract is responsible for such antigenic properties as are possessed by homologous uvea?

TECHNIC

The technic and apparatus used in these experiments are

in every way similar to those described in the work reported previously (15). Perfusions were carried on for a period of approximately three hours, the eyes being constantly observed throughout this interval.

I. ANTIGENIC PROPERTIES OF HOMOLOGOUS UVEA.

To determine the antigenic properties of homologous uvea, dogs were sensitized by intraperitoneal injection of dogs' uveal emulsion, and two weeks after sensitization were perfused with the defibrinated blood of normal dogs, to which dogs' uveal emulsion was added. The dogs' uveal emulsion was prepared in the manner described, in our previous paper, for cows' uveal emulsion—the excised and ground-up uveal tract of dogs' eyes was mixed with physiological salt solution in the proportion of two uvea to 15*cc* salt solution strained, incubated two hours at 37°, twenty-four hours in the ice box, and strained again before use. Seven *cc* intraperitoneally were used to sensitize.

EXPERIMENT I.—*Intraperitoneal sensitization with homologous uveal extract. Perfusion of eyes with specific antigen.*

Feb. 14. Two dogs (16–24, 16–25) were sensitized by intraperitoneal injection of 7*cc* of dogs' uveal emulsion. The dogs showed no symptoms and perfusions were carried out on Feb. 29th and March 1st, dogs' uveal emulsion being added to the perfusion fluid. Both dogs reacted positively, giving the typical anaphylactic reaction, and differing only in intensity. The protocol of dog 16–24 is given below.

Dog 16–24. Sensitized on Feb. 14th, by intraperitoneal injection of 7*cc* dogs' uveal emulsion. On Feb. 29th eyes were negative to external and ophthalmoscopic examination. Perfusion started at 11.40 A.M. Perfusion fluid 800*cc* defibrinated normal dogs' blood, with 200*cc*. Ringer's solution.

11.55 A.M. Pupils equal 11*mm* in diameter. Fundi negative. 30*cc* dogs' uveal emulsion added to perfusion fluid.

12.00 M. Right pupil equals 7*mm* in diameter. Left pupil equals 9*mm*. Both fundi are negative.

12.15 P.M. Right pupil equals 5*mm*. There are numerous small hemorrhages throughout the fundus, and a moderate pericorneal injection. Left pupil equals 7*mm*. Fundus negative except for engorged vessels.

12.30 P.M. Right pupil equals 6*mm*. Fundus and peri-

corneal injection unchanged. Left pupil equals 7*mm*. Moderate pericorneal injection. One small hemorrhage in fundus.

12.45 P.M. The condition of both eyes is unchanged since last note.

1.00 P.M. Both pupils equal 6*mm* in diameter. Moderate pericorneal injection. Condition of fundi unchanged.

1.15 P.M. Right pupil equals 5*mm*, left pupil equals 6*mm*. The condition of the fundi and the pericorneal injection are as previously noted.

1.30 P.M. Right pupil equals 3.5*mm* in diameter. Distinct pericorneal injection. The fundus shows numerous small hemorrhages. Left pupil equals 7*mm*. Fundus shows two small hemorrhages.

1.45 P.M. The condition of both eyes is unchanged.

2.00 P.M. The eyes continue in the same condition.

2.15 P.M. The condition of the eyes is unchanged.

2.30 P.M. Right pupil measures 2.5*mm*. The pericorneal injection and hemorrhages in the fundus are unchanged. Left pupil equals 5*mm*. The pericorneal injection is unchanged. The two small hemorrhages in the fundus are distinct.

2.45 P.M. The condition of the eyes is unchanged.

3.00 P.M. Right pupil equals 3*mm*. There is distinct pericorneal injection with numerous small blotchy hemorrhages throughout the fundus. Left pupil equals 5*mm*. There is moderate pericorneal injection. The fundus shows the hemorrhages before described, and one fresh hemorrhage, above and to the temporal side of the disk.

Perfusion stopped.

From this experiment it is evident that homologous uvea when absorbed has the peculiar property of sensitizing animals of the same species and of producing an ocular reaction upon subsequent perfusion.

In order to establish more definitely the nature of such antigenic properties, the question of organ specificity was taken up. To determine this point, two experiments were performed. In the first, dogs were sensitized to heterologous (cows') uveal emulsion, and were perfused with defibrinated blood of normal dogs, to which homologous (dogs') uveal emulsion was added. In the second experiment, dogs were sensitized to homologous (dogs') uveal emulsion, and were perfused with defibrinated blood of normal dogs to which extract of other homologous organs (dogs' liver and kidney) was added.

EXPERIMENT II.—*Organ specificity.*

Feb. 23. Dogs 16–29 and 16–30 were sensitized by intraperitoneal injection of 7*cc* cows' uveal emulsion. Perfusions were carried out as on March 7th and 16th, dogs' uveal emulsion being added to the perfusion fluid.

These dogs gave very definite reactions to perfusion with the organ specific antigen, the reactions being quite as definite as those obtained by perfusion with species specific antigen. The reactions of the two dogs differed only slightly in intensity. The protocol of dog 16–30 is given.

Dog 16–30. Perfusion started at 10.50 A.M. Perfusion fluid 900*cc* defibrinated normal blood, 200*cc* Ringer's solution. Pupils equal 11*mm* in diameter each. Fundi negative.

11.00 A.M. 20*cc* dogs' uveal emulsion added to perfusion fluid.

11.15 A.M. Right pupil equals 6*mm* in diameter. Left pupil equals 8*mm*. Slight pericorneal injection. Fundi negative.

11.30 A.M. Right pupil equals 3*mm* in diameter. Distinct pericorneal injection. Fundus negative. Left pupil equals 5*mm*. Moderate pericorneal injection. Fundus negative.

11.50 A.M. Right pupil equals 5*mm*. Distinct pericorneal injection. Fundus shows two small hemorrhages near macula. Left pupil equals 4*mm*. Distinct pericorneal injection. Fundus negative.

12.05 P.M. Right pupil equals 3*mm*. Pericorneal injection unchanged. Hemorrhages in fundus somewhat as before. Left pupil equals 4*mm*. One small hemorrhage in fundus.

12.20 P.M. Both pupils equal 3*mm* in diameter. Marked pericorneal injection. There are several small hemorrhages in both fundi.

12.50 P.M. Right pupil equals 3*mm*. Left pupil equals 5*mm*. Fundi and pericorneal injection unchanged.

1.50 P.M. Pupils both equal 4*mm* in diameter. The pericorneal injection is extreme. Both fundi show many small blotchy hemorrhages throughout. Perfusion stopped.

EXPERIMENT III.—*Organ specificity.*

March 27. Two dogs (16–42, 16–43) were sensitized by intraperitoneal injection of 5*cc* dogs' uveal emulsion. Perfusions carried out on April 11 and 13, with the addition of dogs' liver and dogs' kidney extract to the perfusion fluid. Throughout the perfusion neither dog gave any appreciable reaction. The only contraction of the pupil observed was from 11*mm* to 10*mm*. No hemorrhages were observed.

The perfusions exactly resembled those of normal dogs perfused with normal defibrinated blood alone. The protocol of dog 16–42 is given below.

Dog 16–42. Sensitized on March 27th by intraperitoneal injection of 7*cc* dogs' uveal emulsion. Perfusion on April 11th, 50*cc* 5 per cent. dogs' liver extract, and 50*cc* 5 per cent. dogs' kidney extract added to perfusion fluid. Perfusion started at 10.45 A.M. Pupils equal 11*mm* in diameter, fundus negative.

11.00 A.M. Pupils equal 11*mm*. Fundi negative. 50*cc* 5 per cent. dogs' liver extract and 50*cc* 5 per cent. dogs' kidney extract being added to perfusion fluid.

11.15 A.M.	Pupils equal 11*mm*.	Fundi negative.
11.30 A.M.	Pupils equal 11*mm*.	Fundi negative.
11.45 A.M.	Pupils equal 11*mm*.	Fundi negative.
12.00 M.	Pupils equal 10.5*mm*.	Fundi negative.
12.15 P.M.	Pupils equal 10*mm*.	Fundi negative.
12.40 P.M.	Pupils equal 10*mm*.	Fundi negative.
1.00 P.M.	Pupils equal 10*mm*.	Fundi negative.
1.20 P.M.	Pupils equal 10*mm*.	Fundi negative.
1.45 P.M.	Pupils equal 10*mm*.	Fundi negative.

Perfusion stopped.

From these experiments with homologous uveal emulsion, it is evident that homologous uvea possesses striking properties. It is capable of acting as antigen to the homologous animal and is distinctly organ specific. Experiment II, in which dogs sensitized by intraperitoneal injection of heterologous (cows') uveal emulsion gave a definitè reaction when perfused with homologous (dogs') uveal emulsion, shows that there is some constituent of uveal tissue which possesses the property of organ specificity, and is capable of evoking an anaphylactic response in animals previously sensitized to this same uveal constituent, even though from the uvea of an animal of a different species. This observation indeed indicates a chemical affinity for the constituent of the uveal tract concerned in the phenomenon. That this constituent is not the native dogs' protein contained in the blood, smooth muscle, and connective tissue of the uveal tract is evident from Experiment III. In this experiment, dogs sensitized by intraperitoneal injection of homologous uvea gave no reaction when perfused with extracts of dogs' liver and kidney. It is well known that it is impossible to sensitize animals, or to produce anaphylactic symptoms, with such native protein as this, and there is,

moreover, no reason to suppose that the blood serum, smooth muscle, and connective tissue of the uvea differs histologically or chemically from such tissue in other organs.

In view of these experiments, and Experiment I (in which dogs sensitized to homologous uvea reacted to perfusion with homologous uvea), it can be definitely stated that homologous uvea has some constituent which possesses a distinct organ and chemical specificity, and which can evoke an anaphylactic ocular response upon perfusion of the eyes, in animals previously sensitized to such constituent, irrespective of the question of whether sensitization is from uveal tissue of animals of the same or a foreign species.

II. THE PERFUSION OF ONE EYE OF ANIMALS PREVIOUSLY SENSITIZED BY INTRAOCULAR INJECTION OF THE OTHER EYE.

To determine the second of the fundamental points necessary to the clear establishment of the anaphylactic theory of systematic ophthalmia, the ability of uvea absorbed from one eye to produce a hypersensitiveness in the seond eye, which can render the second eye capable of manifesting anaphylactic symptoms upon subsequent perfusion with the similar uvea, the following experiments have been performed. In the first experiment, dogs were sensitized by vitreous injection of 0.5*cc* of heterologous (cows') uveal emulsion, this eye enucleated after a suitable period, and the second eye then perfused with defibrinated blood of normal dogs to which heterologous (cows') uveal emulsion was added. In the second experiment, similar procedure was carried out, using homologous (dogs') uvea as antigen.

EXPERIMENT IV.—*Sensitization by intraocular injection in the left eye. Perfusion of right eye.* (*Heterologous uvea.*)

Jan. 20. Two dogs (16–16, 16–17) were injected in the vitreous with 5*cc* of cows' uveal emulsion. The injected eyes showed a marked inflammatory reaction which progressed to destruction of the eye. On Feb. 20th, one dog showed a beginning inflammation of the right eye. The left eye was at once removed, and within one week the right eye appeared normal with the exception of a slight macula of the cornea. The right eye of the second dog showed no tendency to inflammation. These dogs were perfused on Feb. 23 and 27, respectively. Both gave essentially iden-

tical reactions. Dog 16–17 gave a contraction of the pupil from 12 to 2.5*mm* with typical hemorrhages throughout the fundus. The protocol of dog 16–16 is given below.

Dog 16–16. Sensitized by vitreous injection in left eye of 0.5*cc* cows' uveal emulsion on Jan. 20th. Left eye removed on Feb. 20th. Perfusion on Feb. 27th.

Perfusion started at 11.10 A.M. Perfusion fluid 900*cc* defibrinated normal dogs' blood, 300*cc* Ringer's solution. Pupil measures 12*mm* in diameter. Fundus negative.

11.20 A.M. 20*cc* cows' uveal emulsion added to perfusion fluid. Pupil equals 12*mm* in diameter.

11.30 A.M. Pupil equals 8*mm* in diameter. Fundus slightly congested.

11.50 A.M. Pupil equals 6*mm* in diameter. Fundus congested, slight pericorneal injection.

12.15 P.M. Pupil equals 6*mm*, distinct pericorneal injection. Fundus unchanged.

12.45 P.M. The cornea is becoming slightly cloudy. Pupil and fundus unchanged.

1.20 P.M. Pupil equals 4.5*mm* in diameter. Clouding of cornea and pericorneal injection more marked. Fundus is engorged and shows two small hemorrhages.

1.50 P.M. The eye shows the same exaggerated picture: contracted pupil, steamy cornea, pericorneal injection, engorged fundus with two small hemorrhages.

2.15 P.M. The picture is unchanged since the last note. Perfusion stopped.

EXPERIMENT VI. — *Sensitization by intraocular injection in left eye. Perfection of right eye.* (*Homologous uvea.*)

March 6. Two dogs (16–33, 16–34) were sensitized by injection of 0.5*cc* dogs' uveal emulsion in the vitreous of the left eye. The eyes in each animal showed a marked inflammatory reaction, and on March 26th were both enucleated. The wounds healed rapidly and without complications, and the right eyes remained entirely normal to external and ophthalmoscopic examination. Perfusions were done on March 29 and March 30 with the addition of dogs' uveal emulsion to the perfusion fluid. Both dogs showed similar anaphylactic responses, the contraction of the pupil being the same in both cases. The hemorrhages were more numerous in dog 16–34. The protocol of dog 16–33 is given below.

Dog 16–33. Sensitized on March 6th by intraocular injection of 0.5*cc* dogs' uveal emulsion in left eye. Left eye removed on March 14th. Perfusion of right eye on March 20th. Perfusion fluid 1000*cc* normal defibrinated blood,

250*cc* Ringer's solution. Perfusion started at 12.00 M. Pupil equals 12*mm* in diameter. Fundus negative.

12.20 P.M. Pupil equals 12*mm*. Fundus negative. 25*cc* dogs' uveal emulsion added to perfusion fluid.

12.25 P.M. Pupil equals 10*mm*. Fundus negative.

12.50 P.M. Pupil equals 7*mm*. Moderate pericorneal injection. There is one small hemorrhage near upper temporal vessels.

1.10 P.M. Pupil equals 4*mm*. Fundus and pericorneal injection show no change.

1.30 P.M. There is no change over last note.

2.00 P.M. Pupil equals 4*mm*. The fundus shows the hemorrhage noted before, which appears somewhat larger, vessels are full, fundus is otherwise negative.

2.20 P.M. Pupil has redilated slightly to 6*mm*. Fundus is unchanged. Pericorneal injection poorly marked.

2.40 P.M. Pupil equals 6*mm*. Eye is unchanged since last note.

3.00 P.M. Pupil equals 6*mm*. Pericorneal injection marked. Fundus shows one blotchy hemorrhage in upper temporal field. Perfusion stopped.

These two experiments show conclusively that uveal tissue, free to be absorbed in one eye, can create a hypersensitiveness to uvea in the second eye, and that such free uvea, carried to the second eye by the blood stream, can produce a local anaphylactic intoxication. The conditions in this experiment simulate experimentally, as closely as possible, the conditions under which sympathetic ophthalmia occurs clinically. Although it is manifestly impossible, under such artificial conditions, to reproduce the clinical manifestations of sympathetic ophthalmia, nevertheless the anaphylactic nature of the response in the perfused eye makes it of importance.

III. THE CONSTITUENT OF THE UVEAL-TRACT RESPONSE FOR THE ANTIGENIC PROPERTIES.

Elschnig supposed the pigment epithelium of the uvea to be the constituent concerned in the anaphylactic production of sympathetic ophthalmia, and a glance at the histological structure of the uvea makes the reasons for such a supposition evident. The uvea consists of smooth muscle, connective tissue, blood-vessels, and pigment epithelium. Of these constituents, the pigment epithelium alone is peculiar to uveal

tissue, and it seems natural to assume primarily that this pigment epithelium is responsible for any peculiar properties possessed by uveal tissue. Moreover, Elschnig, by serological studies previously mentioned, has brought together considerable evidence that the pigment epithelium is a constituent responsible for the antibody production following injection of uveal emulsion in animals. Furthermore, the experiments described here under organ specificity seem further to indicate that it is not such a tissue as the connective tissue, smooth muscle, or blood common to all organs, that is responsible for the peculiar antigenic properties of uveal emulsion.

In view of these observations, then, our attention was turned primarily to the pigment epithelium of the uvea in the attempt to determine the constituent responsible for the antigenic properties of uveal emulsion. A number of perfusions have been performed on dogs sensitized with the so-called chemically pure pigment, in which the pigment has been added to the perfusion fluid. The pigment was first prepared by the method of von Szily. In this method the excised uveal tracts are macerated in distilled water, the water being constantly poured off and fresh water added, until the uveæ no longer color the water with pigment. This mixture of pigment and protein in water is then strained through a silk filter, the pigment passing through. The pigment water filtrate is next treated with an equal volume of saturated solution of ammonium sulphate, heated a short time at 80°, and refiltered through a silk filter. The pigment now remains behind on the silk filter, is washed with water until the wash water no longer gives a precipitate with barium chloride, is then washed with alcohol and ether to remove lipoids, dried by heat, pulverized, and made up in a 1 per cent suspension.

With pigment suspensions made up in this manner, numerous difficulties are encountered. The pigment corpuscles, which are of quite an appreciable size, are entirely insoluble in salt solution. Dogs sensitized to this pigment three weeks previously still show deposits of pigment over the peritoneal surfaces when autopsied, and it seems doubtful if the pigment in this artificial form is absorbed to any appreciable extent. Moreover, the addition of this pigment suspension to the perfusion fluid is frequently followed by a total stoppage of the

perfusion, the pigment evidently causing thrombosis of the small capillaries.

We have therefore made many attempts to prepare this pigment in such a form that it could be utilized in perfusion experiments. By drying the pigment in a vacuum in the presence of calcium chlorid, taking directly up on salt solution, and shaking the resulting suspension for twenty-four hours in a shaking machine, a pigment suspension has been finally prepared which offers distinct promise of applicability to this method. However, sufficient experiments have not been performed to allow the report of definite results. Many perfusions have given somewhat contradictory results, and these different results seem directly traceable to the different technic used in preparing the pigment. It may be said, however, that the results of several perfusions seem to indicate that the pigment epithelium may be a constituent of the uveal which is at least capable of acting as a specific antigen. Further work along this line is at present being carried on.

DISCUSSION

From these experiments it is evident that uveal emulsion, acting as antigen, has peculiar properties. Homologous uveal emulsion shows properties similar to those long recognized for lens protein—namely, ability to act as foreign protein to the homologous animal, and characterized by organ specificity.

The uveal emulsion as prepared has two distinct constituents: (1) the pigment epithelium, a constituent peculiar to the uveal tract alone, and (2) such protein as that of blood, smooth muscle, and connective tissue, which is common not only to homologous and heterologous uvea, but also to all other tissues of the body. There is no reason to believe that the protein of smooth muscle and connective tissue of the uveal tract differs in any way from that of smooth muscle and connective tissue of other parts of the body, and it is well known that it is impossible to sensitize an animal to his own native protein of this type. Moreover, the failure to produce an anaphylactic response in a dog sensitized to homologous uveal antigen, by perfusion with dogs' blood, liver, and kidney, show clearly that such protein as that of the blood, smooth muscle, and

connective tissue of the uveal tract cannot produce a hypersensitiveness to similar protein of homologous liver and kidney. Furthermore, the reaction obtained in dogs sensitized to cows' uveal and perfused with dogs' uveal emulsion is manifestly not due to the blood, tissue, and muscle proteins, for such protein is strongly species specific. It seems fair, therefore, to assume that the intoxication resulting from perfusion with homologous uveal emulsion, in animals sensitized either to homologous or heterologous uvea, is due to a hypersensitiveness resulting from absorption of some chemical constituent peculiar to the uveal tract, namely, the pigment epithelium. Moreover, it seems probable that there is a strong biologic and chemical relationship between the pigment epithelium of homologous and heterologous uvea, similar to that already demonstrated for lens protein. However, whether the pigment epithelium acts as antigen through the pigment *per se*, or through the medium of some protein peculiar to pigment epithelium cells, cannot be said. There are many technical difficulties to be overcome, some of which have already been emphasized, before this question can be definitely answered.

The question of histoid affinity of uveal emulsion as antigen, a power of placing the homologous tissue (the uveal tract of the eye) in a condition of hypersensitiveness as compared to other tissue of the body, has already been advanced by Dold and Rados (16). Such histoid affinity, while it offers most attractive ground for speculation, has not as yet been proven an experimental possibility. In our experiments an anaphylactic ocular response has been elicited following intraperitoneal and intraocular injection of homologous uveal emulsion. Whether the ocular sensitization was part of a general sensitization, or a peculiar local sensitization (due to a histoid affinity of uveal emulsion), and whether the anaphylactic symptoms resulting from perfusion with specific antigen were part of a general intoxication or a purely local intoxication cannot be said. The artificial conditions of blood pressure and temperature under which the animals were placed rendered it impossible to detect any general intoxication, even did it exist. Furthermore, the ocular response to perfusion with specific antigen is of such a delicate nature that it might well exist in anaphylactic animals in the absence of less delicate indications to anaphy-

lactic intoxication. It can only be said that a hypersensitiveness of the eyes follows either the intraperitoneal or intraocular introduction of homologous uveal emulsion, and in the present state of our knowledge of anaphylaxis it must be assumed that this hypersensitiveness is part of a general hypersensitiveness.

The experiments in which sensitization was accomplished by intraocular injection are of especial interest. In these experiments the conditions under which sympathetic ophthalmia must occur were comparatively closely simulated—but a small fraction of one uvea being introduced in the eye to be absorbed,—and it is interesting that this led to a distinct hypersensitiveness of the uninjected eye.

The relationship of the peculiar properties of uveal tissue as antigen to the anaphylactic theory of sympathetic ophthalmia is evident. If sympathetic ophthalmia is an anaphylactic uveitis, then some constituent in the uvea of the exciting eye (the necessarily diseased tissue) must be capable of acting as an antigen to the animal. Furthermore, this antigen must be organ specific, else no clinical advantage would result from the enucleation of the exciting eye. The few long-delayed cases of sympathetic ophthalmia reported after enucleation of the exciting eye are possible of explanation under the anaphylactic theory. Any incidental minor disease of the uveal tract would be in sensitized tissue, and any slight degeneration of uveal tissue would liberate antigen capable of producing intoxication, and would start a typical "vicious circle"—an auto-intoxication of the remaining uvea. This supposition is, of course, entirely theoretical.

SUMMARY

Using the ocular anaphylactic response to perfusion with specific antigen as an index, experiments have been performed to determine the fundamental points of the anaphylactic theory of sympathetic ophthalmia. These points were: I. The antigenic properties of homologous uvea. II. The ability of one eye to show an anaphylactic response to perfusion with homologous uvea, in animals previously sensitized by intraocular injection in the other eye of this same antigen. III. What constituent of the uveal tract is responsible for the antigenic properties of homologous uvea?

It was found that homologous uvea possesses antigenic properties and that it is strongly organ specific. Homologous uvea, absorbed from one eye, can produce a hypersensitiveness in the second eye, and intoxication can result from perfusion of the second eye with similar antigen. From the evidence at hand it seems probable that the constituent of the uveal tract, responsible for its peculiar antigenic properties is the pigment epithelium. Whether it is a peculiar chemical property of the pigment itself, or of some peculiar protein in the pigment epithelium cells, cannot be said, until experiments now in progress are completed.

CONCLUSIONS

I. Homologous uvea has the power of acting as antigen and producing an ocular hypersensitiveness.

II. Homologous uvea possesses a strong organ specificity.

III. Intraocular injection of a small amount of either homologous or heterologous uveal emulsion can produce a hypersensitiveness in the seond eye.

IV. From the evidence at hand, it seems probable that the peculiar antigen properties of uveal emulsion are due to the pigment epithelium.

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PRESENT STATUS OF THE OPERATION FOR THE EXTRACTION OF CATARACT IN-THE-CAPSULE.[1]

By Dr. ARNOLD KNAPP, New York.

THE practice of the cataract operation has slowly developed into a more or less standard method which is now generally adopted, still varying, however, on the question of iridectomy, the method of opening the capsule, the way of expressing the cortical remnants, and the frequency and methods of treating the secondary cataract. The subject of cataract extraction about ten years ago took on renewed interest by the revival of the extraction in-the-capsule operation by Colonel Henry Smith in India. This ingenious and dexterous operator with a record of over 30,000 cataract extractions, has developed a technic for the intracapsular extraction which has been fully described both by Smith[2] himself and by a number of ophthalmic surgeons who have visited Smith's hospital in India. The advantages of the intracapsular operation have been advanced so insistently by this group of operators that the question whether this operation should replace the older or capsulotomy operation has been the subject of frequent and often heated discussion.

I am going to preface my remarks this evening by a truism which is particularly applicable when a new method of cataract extraction is on trial. This ophthalmological truism is: The aim of a cataract operation is to obtain the best vision with the least risk to the eye.

As for the first premise, which operation gives the best

[1] Read by invitation before the Clinical Congress of Surgeons, Philadelphia, October 24, 1916.

[2] Smith, *The Treatment of Cataract.* Calcutta, Thacker, Spink & Co., 1910.

vision, we find that the visual results after intracapsular extraction have not been observed nor tabulated in such a manner as to serve as a basis for comparison. It stands to reason that for a satisfactory comparison the best results obtained by either method must be selected. It is obviously not fair to compare the results of a poor capsulotomy operator with those of an experienced cataract-in-the-capsule operator.

On examining the statistics of the capsulotomy operation performed by Herman Knapp,[1] the visual results of 1000 cases show that 52% obtained $\frac{20}{40}$ or better. Duncan[2] in 100 consecutive extractions obtained $\frac{20}{40}$ or better in 69%.

Webster reported on 100 cataract extractions, and the visual results were $\frac{20}{40}$ or better in 57%.

Weeks[3] reported on 100 consecutive cataracts in 1895. Excluding 20 complicated cataracts, 62% obtained $\frac{20}{40}$ or better.

Owing to conditions which obtain in India and which are entirely beyond the operator's control, visual statistics of Smith's cases are difficult to obtain as a suitable examination and observation of the subsequent course of the cases are not possible.

Smith[4] reported in 1905 on 2616 extractions in-the-capsule; the visual results gave 99.27% first-class results, 0.38 % second-class results, 0.34% failures.

Somewhat more definite are the statistics of 132 successive uncomplicated cases published in 1912,[5] where on testing the sight with bull's eyes, he obtained $\frac{6}{9}$ or better in 97%.

Of those who have been to India and have worked under Smith, only a few have published any statistics on operations performed on Europeans after their return.

Greene and Millette[6] reported on the visual results of 203 cases in whom $\frac{20}{40}$ or better were obtained by 73%.

Fisher[7] has recently published the results of 94 consecutive

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[1] Knapp, "Cataract Statistics with Comments." *J. A. M. A.*, Jan. 8, 1898.
[2] Duncan, ARCHIVES OF OPHTHALMOLOGY, vol. xxxvii., p. 300, 1908.
[3] Weeks, *N. Y. Med. Journ.*, 1895, p. 137.
[4] Smith, ARCHIVES OF OPHTHALMOLOGY, vol. xxxiv., 1905.
[5] Smith, ARCHIVES OF OPHTHALMOLOGY, vol. xli., p. 160.
[6] Greene and Milette, *J. A. M. A.*, 1912, p. 328.
[7] Fisher, *Journal of Ophth. and Oto-Laryng.*, Aug., 1916.

intracapsular operations; 80% obtained a vision of $\frac{20}{40}$ or better.

The writer[1] has published the results of 100 successive cataract extractions in-the-capsule by a modified method of operation. Excluding 24 complicated cases, the visual results in 76 were: $\frac{20}{40}$ or better in 97%. In the entire series of 100, this vision was obtained by 70%.

A study of these visual results, I think, will show that the vision obtained in the intracapsular operation is distinctly the better. This is to a certain extent self-evident because if the optical obstruction is completely removed, and there is no other method by which this can be so successfully done, the vision that results must represent the full power of the eye.

On turning to the second premise, the risk to the eye, a number of features in the two operations must be carefully studied. In performing the Smith operation a trained assistant is a necessity, to control the action of the patient's eyelids. The importance of this assistance is insisted upon and the success of the operation depends largely upon this cooperation. This assistance is not always available and retractors have been suggested by Fisher and a speculum by the Greens to replace this trained assistance.

The section recommended and practiced by Smith is a large section embodying half of the corneal circumference, coming out within the clear cornea about *2mm* short of the limbus. While this section is easier to execute and furnishes a large opening for the extraction of the cataract in-the-capsule, it makes a wound entirely in the cornea which does not heal as well as one just posterior to the limbus, protected by a conjunctival flap. It sometimes gives rise to what is called a riding flap, and finally, and of most importance, it is more exposed to infection. A conjunctival flap, to my mind, is an essential in the modern operation for cataract. I am so strong an advocate of the conjunctival flap that I should prefer to give up the intracapsular operation if I had to do it without the conjunctival flap. It causes an occlusion of the wound in a few hours, thereby giving the surest safeguard against infection. A conjunctival flap section has two dis-

[1] Arnold Knapp, ARCHIVES OF OPHTHALMOLOGY, vol. xliv., 1915.

advantages: First, it is more difficult to perform and can not be done in the short number of sweeps with a knife that a corneal section permits; second, it is apt to be followed by a certain amount of hemorrhage which masks the details of the anterior chamber, making the subsequent steps of the operation more difficult. It is this tendency to hemorrhage which Colonel Smith objects to in a conjunctival flap.

The lens is extracted in the Smith intracapsular operation, as is well known, by pressure exerted on the outside of the cornea. This pressure has to be exerted in a definite manner and to a definite degree, both requiring great dexterity and experience on the part of the operator. While a dislocation by this means takes place readily in some cases, in other cases the amount of pressure which is required to dislocate the lens seems great, particularly in unpracticed hands. As a result of this pressure, the great objection to the intracapsular operation results, namely, loss of vitreous.

Loss of vitreous is correctly regarded as an unfortunate accident. While a slight loss of vitreous is frequently followed by good vision and a sound eye, particularly if it occurs after the delivery of the lens, it is an unpleasant complication which should not be minimized. According to Smith's statistics, in his skillful hands the loss of vitreous has been reduced to 5%. I think everybody who is experienced with this operation will agree with me that in other hands the percentage must be much greater: in certain statistics the vitreous loss occurred in 30–40%. In the capsulotomy operation in careful hands vitreous is practically not lost. Aside from the danger of infection which a loss of vitreous entails, it is generally followed with a reaction on the part of the vitreous body, particularly if it was necessary to introduce the spoon into the eye. I have observed in cases of vitreous loss not only an opacity of the vitreous which has often remained, but in many cases an optic neuritis, unquestionably an evidence of a toxic reaction. Finally, and this, to my mind, is the most important objection to a loss of vitreous, even if it be slight it prevents the accurate coaptation of the wound edges of the section, thereby delaying healing and inviting secondary infection, and prevents the proper toilet of the wound, particularly the reposition of the iris columns.

One of the frequent complications of the ordinary capsulotomy operation is iritis. It is stated by the advocates of the intracapsular operation that this is due to the retained capsule and the retained masses. I do not think that this view has been demonstrated. A lacerated capsule in many cases will unite with the adjoining piece of iris. It was this fact which led Herman Knapp to perform systematically a peripheric opening of the capsule with the cystotome, because the wound in the capsule was thereby brought farthest away from the margin of the pupil and the tendency to posterior synechia avoided. There can be no question but that in the intracapsular operation iritis is a very much less frequent complication; at the same time it does occur and a thickening of the hyaloid membrane, indicative of cyclitic involvement, is also observed. Furthermore, hemorrhage into the anterior chamber in these intracapsular cases is extremely slow in absorbing, and apparently causes a permanent deposit of blood pigment on the lens capsule which may interfere with the visual result.

The great drawback, of course, to the capsulotomy operation is the necessity for the needling operation. I can not agree with those who regard this as a minor intervention. While in some cases it is simple to make a sufficient opening in the capsule, I think anyone who has been familiar with the thought which the late Herman Knapp placed in the development of this operation,—and he was one of those who systematically made a secondary operation in 60% of his cases,—will realize the amount of study and the various factors that enter into the successful performance of the needling operation. I think, as a rule, the difficulties of this operation are underestimated. It has been everyone's experience that the results of the needling operation were far from satisfactory, that the improvement of vision did not result as expected and even deteriorated from proliferation of the capsule and vitreous changes.

The applicability of the intracapsular operation for the treatment of immature cataracts is frequently referred to, and its success in this field is one of its brightest achievements. At the same time, it must be said that the dread of operating on immature cataracts by the capsulotomy operation, especially when the capsule forceps is used, no longer exists; the con-

valescence may be somewhat slower, but the ultimate result is most satisfactory.

To overcome some of the difficulties of the intracapsular operation, a number of operators have suggested modifications. Fisher advocates, in addition to retractors for the lids, the use of a needle to assist the lens in its delivery. He believes that thereby he has simplified the operation and has made it accessible to all cataract operators.

It is a mistake, in my opinion, to minimize the difficulties of an intracapsular operation. If it goes smoothly in the hands of a skillful operator, there is no more beautiful operation. In this connection I should like to quote from a paper by Colonel Smith, in which he advises everyone to avoid this operation unless he has had an opportunity of obtaining personal instruction by someone capable of performing the operation or performs at least 100 cataract operations a year.

After my return from a visit to India I did not succeed in subluxating the cataracts with the amount of pressure which I thought was compatible with safety, so I abandoned the Smith operation. On using capsule forceps without teeth, as devised by Kalt, I found that I got such a firm grip on the capsule that I dislocated the cataract in about 50% of the cases. A more detailed description of this method[1] has been reported.

If the lens does not dislocate, the capsule ruptures and a piece of the anterior capsule is removed and the cataract operation then proceeds as in the old operation. By this method the patient is given the opportunity of obtaining the advantages of the intracapsular operation, of course only in a fraction of the cases, with certain definite elements of safety which I think commend it. After the grasp of the capsule, all pressure is exerted away from the vitreous. A speculum is used and no assistant is needed. The peripheric section with conjunctival flap permits accurate replacement of the iris columns and an up-drawn or distorted pupil is unusual. The lens is made to tumble, which is another safeguard against vitreous loss. The loss of vitreous in this operation occurs at the end after the lens has been extracted, frequently in the

[1] Arnold Knapp, ARCHIVES OF OPHTHALMOLOGY, vol. xliv., 1915.

attempt to replace the iris columns or through some untoward movement on the part of the patient.

I have not been able to decide how much traction on the suspensory ligament and ciliary processes it is safe to apply in attempting to dislocate a cataract. If the ligament is very tough, it is safer to abandon the procedure and employ a capsule forceps with teeth, and remove a part of the anterior capsule.

Stanculeano[1] has advocated a somewhat similar procedure, using the convex bend of the iris forceps to dislocate the lens. I have not been able to find out very much about his results; they have not, at least, been published.

Tőrők[2] has modified this procedure as follows: after grasping the capsule with the Kalt forceps he applies pressure in the lower part of the cornea. With this combined traction and pressure the cataractous lens is extracted. It would seem to me that the capsule is more apt to rupture in this technic and that there is a somewhat greater possibility of vitreous loss. Verhoeff[3] is pleased with his results obtained by this modified technic and has made a number of changes in the Kalt forceps.

I have written to nine American ophthalmologists who have visited India and been trained under Smith's direct instruction, asking their opinion of the Smith operation from an American standpoint: its applicability to European patients and their results. I have received answers from eight, which I take leave to introduce. I want to express my thanks to these gentlemen for their courteous replies and hope that I am correctly interpreting their views.

Dr. C. F. Clark of Columbus, Ohio, states that he has not operated though he has had some cases especially adapted to the Smith operation, but an unusual degree of coöperation between the operator and assistant is necessary so that he has not felt justified in attempting the operation. A large, clean, simple capsulotomy, and as much of the lens removed as can be effected without serious traumatism, give the patient better

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[1] Stanculeano, *M. f. Augenhlk.*, vol. l., 1912, p. 527.
[2] E. Tőrők, *T. Am. Ophth. Soc.*, 1916.
[3] Verhoeff, *T. Am. Ophth. Soc.*, 1916.

chances than with the Smith operation, and while he is entirely ready to acknowledge that in a number of instances brilliant results can be obtained by the Smith method, the number of cases in which dismal failures follow it would be enough to deter him from adopting it as a routine practice. Without wishing to entirely condemn the Smith operation, Dr. Clark believes it to be a valuable procedure, adapted to certain carefully selected cases, and in the hands of a cautious operator, under favorable conditions, good results can be obtained from its employment. It is, however, an extra hazardous procedure, and a careful, conservative ophthalmic surgeon will make use of it only in selected cases.

Dr. J. W. Millette of Dayton, Ohio, though not a visitor himself to India, was associated with the late Dr. D. W. Greme and so I have asked him for his views on the Smith operation. Dr. Millette has performed since October, 1913, about two hundred intracapsular operations for cataract, and operates by the intracapsular method in all cases of senile cataract. The average vision resulting from an equal number of operations by the intracapsular method and by the capsulotomy method, performed by the same operator on the same class of patients, he believes is somewhat better by the intracapsular than by the capsulotomy method. Loss of vitreous is a little more frequent; infections are no more frequent; post-operative inflammations are not so frequent by the intracapsular method. Pupils are by no means so pretty as by the simple method, nor scarcely so pretty as by the combined method. The technic of the intracapsular method is more difficult to acquire. The intracapsular operation in Dr. Millette's opinion is the operation of choice if the operator has sufficient opportunity to acquire and retain the requisite skill.

Dr. D. T. Vail of Cincinnati, Ohio, endeavors to extract every operable senile cataract, regardless of the stage of ripening, exactly according to the Smith method. The lens is delivered in its capsule *à la Smith*, by external pressure, and without introducing the spoon in the vitreous in approximately fifty per cent. of the cases, thus performing what is known as a perfectly smooth operation. In case the lens is stubborn and refuses to move, he strips off the anterior capsule with specially devised forceps of his own design. He concludes

that smooth deliveries by the Smith–Indian technic surpass any other known operation in expedition, brilliancy, and satisfaction. Smith's operation is of inestimable value in solving the problem of what to do for immature cataract. To be appreciated, it must be mastered.

Dr. Dorland Smith of Bridgeport, Connecticut, states that the Smith operation is his operation of choice for senile cataract, and he does it regularly, unless there is some reason to the contrary, such as poor assistance, very prominent eye in a badly-behaved patient, or difficulty in dislocation of the lens. These reasons are not very common, and he has been doing the Smith operation in over ninety percent. of all cases of senile cataract. He thinks that the Smith operation is more difficult and has more possible dangers, requires more special training and requires better assistance than other cataract operations; on the other hand, when well done it results in a sounder, more satisfactory, and more durable eye—an eye which maintains its vision better, not only because of freedom from capsule thickening, but because of greater freedom from iritis, secondary glaucoma, iridochoroiditis, and all those slow degenerative changes which cause the eventual loss of many aphakic eyes months or years after extraction by methods in which the capsule is left behind. He is inclined to believe (1) that we lose vitreous a little but not much oftener by this method; (2) that we have a little more iris entanglement, but that it does much less harm when the capsule is out; (3) that the cosmetic result is not so good, but the visual result averages better; (4) that the operation is more risky unless one has had special training for it, but that when well done it approaches more nearly the ideal of cataract extraction than any other method.

According to Dr. C. B. Meding of New York, the Smith–Indian operation is the operation of preference in all cases of cataract in patients forty years of age and upward, and of cataracts in patients of less age where the conditions of senility are apparent. He regularly attempts it, though the attempt is not persisted in where extreme hypermaturity, plus tension or incontrollability of patient, demands increased pressure or makes such increased pressure dangerous. His conclusions are: that, for absence of irritation, uninterrupted recovery,

visual results, and cosmetic appearance, the Smith operation leaves nothing to be desired; that the need of the skilled assistant is obviated by the use of the properly adapted Green speculum; that the difficulty of operation is no greater where the technic and operative ability of the surgeon have received as much practice and training as are necessary for the performance of any cataract operation, but that it is a dangerous procedure for self-sufficient amateurs; that adaptability for the immature cataract, absence of discissions, and absence of inflammation make the Smith the operation of routine, but that no operation is all-sufficient, and procrustean methods are never scientific; that it is the only satisfactory operation for immature cataracts.

Drs. A. S. and L. D. Green of San Francisco, California, perform the Smith–Indian operation in all cases of senile cataract. Their opinion, based on approximately a hundred senile cataracts which were operated on in this country by the Smith method, is that it is pre-eminently the operation of choice, but they are not so sure, however, that it would be suitable for general adoption without special training. Their principal objection to the operation is that in many cases the pupil is drawn up. This, however, is an objection largely for cosmetic reasons, and not from the standpoint of utility.

Dr. W. A. Fisher of Chicago is doing the Smith–Indian operation upon all cases of senile cataract, and his results are much better than those he obtained previously by the capsulotomy method. In his opinion the Smith–Indian operation is the best operation for cataract yet devised. His hooks replace the speculum and to a certain extent the trained assistant; the needle reduces the danger of vitreous loss, though the capsule more readily ruptures. The Smith–Indian operation is too difficult for operators in general unless his modifications are employed.

My own reasons for abandoning the Smith–Indian operation have been fully stated in this paper. On reviewing these opinions, we find that two do not practice the Smith operation at all, that one performs it in fifty percent. of the cases, and that the remaining five perform it in all cases with certain provisions. Of these five, a series of consecutive cases has up to the present date been published by only one. I do not think that the profession at large will know any more about

the risks of the Smith–Indian operation until more reports appear.

My own opinion is that the whole question narrows itself down to this: Are we justified for the purpose of obtaining better vision in some additional cases to increase the number of poor results and failures directly referable to the method of operating? I think not. At the same time the extraction of cataract in the capsule is so ideal that our endeavors and the progress in ophthalmic surgery must be along the lines of intracapsular extraction, devising a method which is easier to perform and less dangerous to the eye than the Smith–Indian operation. Whatever success these efforts will have, will be entirely due to the pioneer work of Henry Smith.

THREE CASES OF UNUSUAL VITREOUS OPACITIES.

By Dr. H. H. STARK, El Paso, Texas.

NUMEROUS causes have been advanced for vitreous opacities, many of them based on true pathological findings, but in the cases I wish to report I have found nothing to account for them, and as the patients are all living, no opportunity to make a pathological examination has presented itself. I, therefore, wish to make this report, hoping that sometime in the future chance may favor me by placing in my hand one of the eyes for sectioning.

The first of these cases came under my care in 1912, one in 1913, and one in 1915, and as they are all of the same appearance, I will give a general description of them, with special report on each. The vitreous in each one was clear except where the opacities were seen. On looking into the eye the nerve could be distinctly seen, as could all parts of the fundus. It is only when increasing strength plus lens were thrown in that the opacities would come into view. If this had not been the rule of the examiner in all eyes, the opacities would have been overlooked. They consisted of opaque globules of intense whiteness, the color being that of the change seen in albuminuric retinitis, ranging in size from the caliber of the smaller vessels to that of the largest. They are round in form, some of them perhaps disk-shaped, being thicker in the center than at the edge. Occasionally one is found with a few short blunt rays, resembling those seen when molten metal is dropped on a cold surface, and less often one is found irregular in shape, but still having a tendency to the globular form.

They resemble more than anything I know white paint stippled on a surface or dropped in water. Most of them are fixed in position, but have a slight movement in the changed

position of the eye. Some of them seem to be unattached and have a more extensive motion. They are bright in appearance, but have no tendency to crystalline form, neither do they reflect light like cholesterin, or any substance of that character. That they do not interfere with sight is illustrated in Case 3, where normal vision was obtained in each eye with correcting lens. Case 1 also shows the same vision in each eye, the opacities being found only in the right.

CASE 1.—Dr. C. H. F., age 64, parents born in Holland, but emigrated to this country early in life. The patient was born in America, but has been a resident of Mexico for thirty years; rather stout; good liver; addicted to the use of tobacco and alcoholics; gives history of having been healthy except for an accident about thirty years ago, in which he had a compound comminuted fracture of the left leg, which left him partially crippled. He came under my care May 10, 1912, giving a history of not having had good vision for some time—particular complaint was in reading. He was wearing each eye plus 5.50 for reading, no glasses for distance. He gave no history of eye trouble other than loss of vision. His vision at this time was counting fingers with the right eye at ten feet; left at twelve. Examination of the eyes showed no change in the cornea, anterior chamber, or pupil. Through the normal pupil the nerve head could be seen, which was rather pale. No change found in the retina or choroid, and the vitreous was clear with the exception of about 100 or 150 white dots, above described. On focusing at different points between the nerve and the lens it was found that these commenced about one fourth the distance from the nerve and were distributed in all directions through the perfectly clear vitreous to a point just behind the lens. Examination of the left eye showed the same nerve condition, the vitreous being perfectly clear and free from dots. The field of vision in both eyes showed a normal periphery for white, central scotoma for red and green; others not taken. For a more complete examination the pupil was dilated with one drop of homatropine and cocaine, and retinoscopy showed that he accepted plus 1.75 sphere in both eyes, which gave him a vision of $\frac{20}{20}$ in each. Later, pupils normal, with plus 1.50, he showed $\frac{20}{20}$ in each eye. The latter glasses were ordered for distance, with plus 4.00 for near, which gave him S/.25 at 14 inches.

Urinalysis showed slight albuminuria, with a few granular casts, specific gravity 1.025; pulse 50; blood pressure not taken. Thinking the eye condition might possibly be due to this trouble, he was placed on a diet, and during the

following month decreased in weight twelve pounds. One month later his vision was $\frac{20}{40}$, which in one month more became $\frac{20}{30}$. In August he had lost seventeen pounds in weight, and his pulse rate was 66. He then passed from under my care until May, 1914, when he again called, complaining of failing sight, this time showing $\frac{20}{100}$ with his old correction, which vision could not be improved with glasses. He again returned in December, 1914, the vision being the same as at last examination. This time, however, he admitted that he had had a suspicious infection forty years ago, for which he had taken mercury by fumigation for six or eight months, having had no treatment since that time. The Wassermann test was made, which showed a weak positive. I advised anti-syphilitic treatment, but he returned home not fully convinced that he should take it. I examined him again in June, 1916, finding the vision $\frac{20}{30}$ with his old fitting; reading was now being done with his near correction and a reading glass. Both eyes showed the same periphery field, with a central scotoma for color up to five millimeters in size; for green up to ten millimeters. There was no change in the vitreous opacities. He had never taken any specific treatment. I had never seen a vitreous opacity like the one in this case, so was unable to make a diagnosis, but from lack of history of eye trouble other than eyestrain, possibly due to hypermetropia, I figured that the eye condition was due to some physical ailment—at first kidney trouble, and later syphilis. However, I am unable to determine the exact cause.

CASE 2.—Male, American, age about 60, railroad engineer by occupation, resident of this section of the country for about fifteen years. Came under my care February 19, 1913, ordered by the railroad for vision test. On examination I found he had ability to count fingers at twelve feet in the right eye; left eye $\frac{20}{30}$. He stated that he had never had any trouble with his eyes, and that he had always been well. No previous record of sight could be obtained, as the railroad for which he had been working a number of years only recently had established a requirement for physical examination and test of sight and hearing. He was a man addicted to the use of alcoholics, of medium weight, fairly healthy appearance, and stated that his health was good. Examination of the right eye showed a nebula of the cornea to the temporal side of the pupil; otherwise normal in appearance. The fundus could be distinctly seen and no changes were found. The vitreous was clear, with the exception of about 10 or 15 white dots of the same size and appearance as in Case 1, but not so numerous. They began about half-way from the posterior pole of the

eye, and were to the temporal side of the nerve, distributed forward to the lens. They were stationary in place, one or two showing slight movement on changed position of the eye. The nerve was pale, otherwise the fundus normal. Retinoscopy showed the right to take a plus 4.00, combined with plus 1.00 cylinder, axis 60, giving a vision of one letter of the $\frac{20}{100}$ line. Left eye normal in appearance, the vitreous free from dots and with plus 0.25, combined with 0.75 cylinder, axis 180, gave a vision of $\frac{20}{20}$. No blood test, urinalysis, or further examination of the eye was made. I ascribe the loss of vision in the right eye to amblyopia exanopsia, and the nebula of the cornea to an eczematous keratitis in childhood. I put little credence in the statement that he had always seen well, believing that poor vision in the right eye was responsible for his going into the employment of a railroad where there was no standard of sight required. Judging by the other case, I concluded that the vitreous opacity had nothing to do with the loss of vision.

CASE 3.—Mrs. M. S., Mexican, age 35, formerly trained nurse; had one healthy child eight years old; rather stout but apparently in good health; present occupation seamstress.

Came under my care in November, 1915, with the history of having had more or less pain in her eyes following close work for at least ten years. This had been relieved at one time by glasses, which later she discarded. Several years after this the pain returned, and she was fitted with glasses several times, with no relief. The last two years she has always had pain on doing close work; at times could not sleep from it. She stated that she had always been healthy, and had never had any redness or trouble with her eyes, except that described. At the present time she is constipated.

Vision of the right eye $\frac{20}{30}$; left $\frac{20}{20}$. External appearance of both eyes normal, the right showing normal nerve, retina, and choroid; vitreous clear with the exception of the white dots. These were evenly distributed in a greater number than in Case 1, from the posterior pole almost to the lens, leaving no large space entirely free from them. Left eye normal in appearance, nothing found in the vitreous or fundus. Field of vision of both eyes normal; urine normal.

Based on many years' experience with the race, also blood tests (1) together with the history and positive blood finding in Case 1, the case was put on increasing doses of potassium iodide, having in view a future Wassermann test and refraction. She gradually worked up to a dose of thirty-two drops of the saturated solution, which proved to be the limit. A slightly smaller dose was continued for some time,

but no effect on the opacities was noticed. Wassermann test was made in February, 1911, which proved negative. She was refracted under homatropine, which showed that she accepted plus 0.50 combined with 0.50 cylinder, axis 90, which gave a vision of $\frac{20}{20}$ in each eye. The cylinder with plus 0.25 sphere was ordered, which gave entire relief from the asthenopia, even though she continued her occupation of sewing each day, with so far no return of the symptoms.

The normal vision obtained with correcting lens in this case convinces me that the opacities in no way interfered with the sight. On investigating the text-books I found nothing bearing on these cases. Through the kindness of Dr. George de Schweinitz, I was referred to Benson's case (2) of asteroid hyalitis, which seemed to be the first paper describing a like condition. This case was a man 62 years of age with the opacities in the right eye, who stated that he had always been in the habit of reading a great deal; that thirty years ago he read for eighteen consecutive hours, with only slight interruptions. Afterwards he felt his eyes much fatigued and uncomfortable, but there was no exterior sign of inflammation. He did not then rest his eyes properly, but continued to read though they ached whenever he used them for even a short time. Eight years ago for the first time he noticed three or four spots before the sight of his right eye. These still remained. His general health was excellent, and he has not suffered from either gout or rheumatism, hereditary or acquired, nor has he any renal or cardiac disturbance. He had syphilis pretty badly thirty years ago, but no manifestations since. For some time past he has used glasses of plus 2.75 sphere for reading, which he can use perfectly well for a short time, but asthenopic symptoms come on quickly after reading. His distant vision in each eye is $\frac{6}{6}$. His refraction shows plus 0.75 sphere, with hardly any difference in the acuity of each eye.

He then describes the vitreous opacities, which correspond very closely to those seen in my three cases. He is quite convinced that they are not cholesterin crystals. He says as to its probable cause and nature: "I am disposed to think it must have been a congenital condition, for it is hard to believe that any post-natal inflammation so extensive and severe

as to have such results could have affected the nutrition of the eye so little. Neither can I believe that the long spell of reading had any causative influence, though the patient himself dates all the trouble from that day, and is sure of the connection."

He kept the patient under observation for nine months, treating him with iodide of potash and mercury, with no appreciable change in the condition.

In discussing this case Argyll-Robertson stated that he had a similar case with the exception that the spots, which were extremely numerous, were loose, instead of being fixed, resembling a series of snowballs. He was unable to account for them in the slightest degree. They were not cholesterin, for they were not glistening, angular, or crystalline.

A rather exhaustive search of the literature discloses one other case—that of Pollock (3). Pollock's case had a glaucoma in both eyes. The right, being blind from the disease, was the one in which the opacities were found. In the left eye he reports that the main downward branch of the central vein is covered to the bifurcation by a white tissue derived from the vascular origin, over which passed the inferior branch of the central artery. The description of the opacities was practically the same as that given by Benson and the ones found by me. He is also convinced that they are not cholesterin or crystals of any kind. He assigns no cause for the condition. The condition of the left eye may be significant as either having come from the same cause as the opacities of the right vitreous, or as a congenital anomaly. These two cases are so nearly like the ones I report, that I think they were more than likely the same condition, and neither of the authors has positively found the cause.

The difficulty in these cases seemed to be in finding the cause of the trouble. I feel, as does Benson, that the long-continued reading was not in itself the cause; neither do I believe that the glaucoma in Pollock's case was the cause, otherwise we would have had the trouble in both eyes—besides, were glaucoma a cause, many more cases would have been reported in the literature.

The congenital or hereditary theory is argued against, in so

far as no case has been reported under thirty-five years of age Should one be found in a child or young individual, we would be more inclined to this theory. I have examined the sister and child, aged nine years, of Case 3, both of them being negative. Nationality seems to play no part in the disease, as Benson's case was undoubtedly an English subject, having been an officer in the Crimea. Pollock's case was most likely Bohemian or German. One of my cases was Dutch descent, but born in the United States; one American, and one Mexican or Spanish Indian, showing a very wide distribution of nationality. As to sex, there are three male and one female. Having three cases in my practice, when only two can be found reported in the literature, would lead one to think that the locality has something to do with the cause, which may be possible, as the shortest time any one of them has spent in this region is fifteen years—the longest thirty-five.

Just what climatic condition would influence the formation of such opacities, I am unable to say, unless it is the very constant sunlight we have. Pollock's case is the only one showing inflammation at the time of discovery. My Case 2 must have had severe inflammation in childhood. What part eyestrain plays, we are unable to say, but it may have been an important factor.

It will be noted that all cases were in the right eye. Whether this is significant of anything I cannot say. These cases seem to open up the old question of whether we can have inflammation of the vitreous with no involvement of other structures of the eye. Parsons (4) does not think this possible, disagreeing with Straub on the subject, but the latter has persisted in his original idea, as is illustrated by papers published by both himself and students. In one of his late very elaborate papers (5) he opens with this statement: "Fifteen years ago I defended at the annual meeting of the Heidelberg Society the opinion that among the diseases of the eye there should be distinguished an inflammation of the vitreous body (hyalitis). The way I came to this opinion was very simple. I injected pathogenic microbes into the vitreous of a rabbit. These made a culture there, and there only, and attracted toward the vitreous serous and corpuscular exudation. What name could you give this process but that of inflammation of the

vitreous? It is true the ciliary body produced the white corpuscles and the serum, but this gives us no right to speak of cyclitis. . . . The key to the understanding of this question is given by Metchnikoff's theory, which says that leucocytes in their movement are guided by chemotaxis; that they only go where attracting chemical substances are present in the required concentration, and they do not let themselves be poured out. So microbes in the vitreous attract leucocytes toward the vitreous; microbes in the ciliary body attract leucocytes to the ciliary body."

In discussing this paper Parsons again disagrees with Straub. Were we willing to accept Straub's theory that there can exist a hyalitis independent of the other structures of the eye, these cases would be more easily explained. The general appearance of the spots gives one the impression that the vitreous spaces are filled with white exudate. This is strengthened by the fact that most of them are fixed in position. Straub carried on his experiments with tubercle bacilli, but knowing the tendency of syphilitic infection to penetrate the deeper tissues as time advances, one can readily see that this infection, as well as others, might be the cause, and two of the five cases give a positive history of syphilis. After the first case gave a history of infection with a positive Wassermann test, I was inclined to the belief that this was the cause, but after Case 3, in whom for racial reasons I fully expected to find the disease, showed a negative Wassermann test, my belief was shaken, though I am not fully convinced that the infection was not present even with the negative blood test. After reading Benson's report, I was more convinced than ever that the disease plays an important rôle in the etiology.

Personally I find no one thing common to all the cases, but have been promised one of the eyes on the death of the patient, so I hope to be able in the future to submit it to microscopical or chemical examination, if necessary, which may throw some light on the subject.

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THE TRAUMATIC TRANSPLANTATION OF CILIA INTO THE ANTERIOR CHAMBER.[1]

By HOWELL L. BEGLE, M.D., Detroit, Mich.

IN perforating injuries of the eyeball, eyelashes may be cut or torn from the lid margin by the perforating object and carried with it into the eye. Also in operations, where the eyeball is opened, cilia may be cut by the instrument in the hand of the operator and introduced into the anterior chamber. While the transplantation of cilia is not very infrequent in injuries, it is an exceedingly rare occurrence during operations. When operating, nevertheless, we should bear in mind the possibility of this accident happening, for a number of authentic cases are on record.

Cilia are transplanted into the anterior chamber of the eye most often in those types of perforating injuries where the penetrating instrument does not remain in the eye. Occasionally a fragment of steel or copper may carry with it a cilium into the vitreous, or, the metallic fragment may enter the vitreous while the cilium is left behind in the anterior chamber. The cilium may be free and movable in the anterior chamber; more often it is fixed, either through contact with iris, pupil, or angle of chamber, or through being embedded in exudate, blood, or opaque lens matter. Often one end of the cilium remains fixed in the corneal wound.

The presence of cilia in the anterior chamber may be quite easily overlooked. Focal illumination and a monocular or binocular loupe are of assistance in their detection.

Inasmuch as cilia, because of their position and function,

[1] Read before the Section of Ophthalmology and Oto-Laryngology at the annual session of the Michigan State Medical Society, Houghton, August, 1916.

catch innumerable dust particles and dirt, it might be supposed that when carried into the anterior chamber, they would frequently be a source of infection and set up severe purulent or plastic inflammation. The contrary, however, appears to be true, cilia in the anterior chamber being borne by the eye, generally for considerable periods, without marked reaction or serious results. In explanation of this phenomenon attention may be called to the fact that the rapid filtration of aqueous from the anterior chamber allows little opportunity there for bacterial growth. Moreover, cultural attempt by Müller showed, rather surprisingly, that cilia are not very often harborers of pathogenic micro-organisms. Even when infection does occur in perforating wounds where cilia have been implanted, the infection may have been brought about by the perforating object rather than by the cilia.

If the cilium is a carrier of pathogenic micro-organisms it can undoubtedly set up purulent or plastic inflammation. Two cases reported by Hirschberg point to cilia as a source of such infections, for in both instances a circumscribed purulent inflammation cleared up after the removal of the implanted cilia.

While cilia, as stated, may remain in the eye for many years without giving rise to any disturbing symptoms, in many cases they have, sooner or later, caused complications, such as recurrent irritation, mild plastic inflammation, and epithelial tumors or cysts. Mechanically a cilium may give rise to irritation, especially where the point of the cilium is in contact with iris or cornea. Partial expulsion of cilia from the anterior chamber has been reported. This appears to be largely due to the long-continued irritant action of the cilia at the point of contact with the cornea. Iris hyperæmia and mild plastic inflammation may occur at repeated intervals from the scratching and pricking to which the iris is subjected during normal movements of contraction and dilatation. Exudate may be thrown around the eyelash at such times. Where severe plastic inflammation occurs in perforating wounds, where in addition to the presence of implanted cilia there are traumatic cataract, anterior synechia, or wounds of the iris, the cilia may be only one of the responsible factors in the inflammation.

An interesting complication of cilia in the anterior chamber

is the occurrence of epithelial cysts or tumors. It is well known that living epithelium, transplanted experimentally by operation or by trauma into the anterior chamber, may continue to grow and form there so-called epithelial pearl tumors or cysts. Rothmund (1871) collected from literature thirty-six cases of these tumors, in twenty-eight of which there was a perforating wound, and in three of these there were eyelashes in the anterior chamber. Since this time a considerable number of pearl tumors due to eyelashes in the anterior chamber have been reported. The epithelium of the root-sheath of the cilium proliferates forming a tumor mass which readily undergoes degeneration with formation of fat and cholesterin globules. At first usually in contact with the iris, these tumors may enlarge so as to encroach on other walls of the anterior chamber. Clinically, their growth may lead to visual disturbances, inflammation, or increased tension.

Cilia which have remained for a considerable period in the anterior chamber undergo, as a rule, some change in appearance. They are bleached out by the aqueous humor, the hair may be split, or the cuticle separate. Wagenmann, in his résumé, states that through giant-cell formation cilia eventually may be absorbed.

Perforating injuries of the eye with cilia in the anterior chamber, complicated by purulent or plastic inflammation, call for the removal of the cilia at the earliest possible moment. Even though one is uncertain regarding the source of the infection, the cilia should be removed. In cases where the inflammation is plastic and circumscribed about the cilia, the removal of the latter offers a fair chance of checking the inflammation. Even cilia which are retained in the anterior chamber, without causing irritation or producing other ill effects should as a rule be removed unless circumstances are such that the patient can be kept under observation. In such cases the operator has considerable leeway as regards the time of operation and can often make his attempt at removal at a time when other operative procedures, such as removal of cataractous material, are undertaken. Occasionally the cilium may be removed shortly after the injury through the corneal wound, especially if the eyelash is in contact with the wound.

It is by no means an easy matter to remove a foreign body

from the anterior chamber on account of the rapid outflow of aqueous and the tendency of the iris to prolapse through the wound. Fortunately the aqueous, when escaping, often carries with it the implanted eyelash. Before incising the cornea, eserine should be instilled, this procedure helping somewhat in preventing iris prolapse. The incision should be made at a point offering the best opportunity for seizing the cilia; a small forceps with serrated blades is perhaps most useful. Anterior or posterior synechiæ or other complications may determine the point of incision. Where cilia lie upon the iris or are entangled in it, it may be necessary to remove a portion of the iris with the cilia. Unless necessary, however, a coloboma should not be made on account of the resulting visual disturbance.

I desire briefly to report three instances of this condition without further comment than to direct attention to the partial expulsion of the cilia in Cases 1 and 3, as the observations in this connection, in the opinion of the writer, pertain to the most noteworthy feature of the cases described.

CASE 1.—L. D., age 19, was holding an axe to cut off an extruded brass rod, when particles of metal lodged in his face, hand, and right eye. I saw him the day after the accident. There was a small perforating wound of the cornea, located paracentrally, down and out. From the inner lips of the wound, a single full-length cilium extended horizontally in the anterior chamber with the point free. There was a punched-out hole in the iris, 3*mm* below the pupil. The lens appeared uninjured. Back of the lens and below there was an exudate in the vitreous. No foreign body was seen. Vision was reduced to counting fingers at three meters.

The X-ray showed a shadow just back of the lens about 5*mm* below the horizontal plane.

One of the pieces of metal which had entered the hand was easily removed and was found to be brass. Externally the reaction of the eye was at no time severe. The exudate in the vitreous remained localized. About five weeks after the injury the corneal wound, containing the base of the cilium, suddenly showed evidences of local irritation; a narrow zone of the cornea adjacent to the wound became infiltrated and slight bleb-like swelling of the epithelium over the wound occurred with localized ciliary injection. The patient experienced a feeling of a foreign body. This condition persisted for a week when the wound and cilium resumed their

original quiescent state. Three months after the injury, the eye was pale, part of the exudate in the vitreous had been absorbed, and vision was one tenth. Removal of the cilium was advised, but the patient has not yet consented, and has not been seen since last May.

CASE 2.—W. S., age 32, a Polish laborer, was disentangling coiled brass scrap when the end of one of the coils struck him in the left eye. I saw him the day of the accident, Nov. 15, 1915. There was a lacerated wound of the cornea on the nasal side about 4*mm* long. The iris was adherent to the posterior lips of the wound. The chamber had reformed and contained four eyelashes, two matted together in the upper half, the point of one touching the iris, while the other two were free in the lower half of the chamber. The cilia were 5 or 6*mm* in length. The lens capsule was torn and there was beginning opacification of the lens fibers. Examination of the lid margin failed to reveal the origin of the transplanted cilia. An X-ray examination was negative.

The opacification of the lens gradually increased and the cataractous lens matter began to bulge through the rent in the capsule. The injection of the ciliary vessels increased and the eye became painful. The blood-vessels of the iris were enlarged and were especially prominent where the point of one of the cilia touched the iris. Exudate was thrown partially about this eyelash.

Ten days after the accident, on account of pain and marked reaction, I made a keratome incision in the cornea above and removed as much of the lens matter as possible. Two of the cilia were washed out with the cataractous lens matter. One was removed with an iris forceps without much difficulty, while the fourth could not be located at the time of operation but was found a few days later to be still in the anterior chamber.

From this time there was a gradual absorption of the remaining lens matter. This was accompanied by exudation about the torn capsule and adherent iris with subsequent vascularization and organization. On January 18th I attempted to remove the single remaining cilium by keratome incision of the cornea. I was not successful in securely grasping the cilia with forceps but fortunately it was eventually washed out by the escaping aqueous.

On March 14th, on account of the corneal scar and organized exudate in the anterior chamber about the adherent iris which partially blocked the pupil, I made a small iridectomy downward and outward. Healing occurred promptly.

The patient denied light perception although the pupil

reacted to light. The fundus was clearly seen and appeared normal. The exact visional function was not obtained.

CASE 3.—M. I., a furnace tender, 29 years of age quit work on April 10th on account of an inflammation of the left eye. He stated that on April 8th, while chipping out fire brick, something struck him in this eye.

I saw him first on April 10th. There was marked injection of conjunctival and deeper vessels of the left eye. The cornea was steamy; the anterior chamber shallow. The eyeball was tender on pressure and its tension increased to about plus 2. I could detect no break in the continuity of conjunctiva, cornea, or sclera, indicative of recent trauma. There was evidence of an old lesion, however, in the presence of a white glistening corneal scar and a small irregular pupil containing a thin connective tissue membrane. Vision: light perception; projection faulty.

Through the cornea on the temporal side, in no connection with the scar of the cornea, could be seen an eyelash about 5*mm* long. It appeared as if partial expulsion of this eyelash from the anterior chamber had taken place. The point of the eyelash was located just under the conjunctiva at the corneo-scleral margin. About 1½ *mm* back from the point, the eyelash came into direct contact with the superficial epithelium of the cornea causing a bleb-like prominence of the epithelium. From this point of surface contact, the cilium was bent sharply backward and the rest of it appeared to lie in the posterior layers of the cornea or possibly on its posterior surface. The cilium was obscured partially by exudate.

An X-ray examination of the right orbit showed no shadows indicative of a metallic foreign body. To diminish the tension of the eye, I incised the cornea, August 11th. My incision was made parallel and close to the implanted cilia. With the blade of a mouse-tooth forceps, I endeavored to loosen the cilium from the posterior surface of the cornea and drag it out through the wound. The cilium appeared, however, to be too closely in contact with the cornea to be displaced and my attempt was unsuccessful. A small prolapse of the iris which occurred was excised. Two weeks later, tension of the eye was minus, vision nil, and as the eye was painful, enucleation was advised. This was refused. The redness and irritability of the eye gradually decreased and the patient resumed his occupation May 1st.

IS AFTER-CATARACT MORE FREQUENT AFTER OPERATIONS FOR IMMATURE CATARACT?

By Dr. THEODORE HEYL,

Assistant, University Eye Clinic, Munich.

Translated from *Archiv f. Augenheilkunde*, Vol. LXXVIII., 1915.

THE indications for a cataract operation have changed in recent years, and the maturity or the degree of lenticular opacity are no longer determining the operability of a cataract owing to the general use of aseptic operations and improvement in methods of operating for after-cataract. A. Graefe (1884) stated that the following forms of cataract could be completely extracted even when immature:

1. Cataracts with a dark yellow or brown nucleus, the corticalis still transparent with occasional dots and lines. This form of cataract is particularly prevalent in myopic eyes.

2. Cortical cataracts in which the posterior cortical layer is transformed into a homogeneous uniform opacity.

3. Lenses in which many linear and punctate opacities are uniformly distributed through all the layers.

Hess, in his *Pathology and Therapy of the Lenticular System*, says: "It is not proven that the percentage of after-cataracts is greater in operations for immature cataracts or that the after-cataract is more dense than in the cases where exclusively mature cataracts are extracted. After an experience of many operations for immature cataract, I have become convinced that with the use of suitable methods for removing the lenticular cortex, after-cataract operations are not more frequent after extractions of immature cataracts than in the cases where the cataract has been mature or has been artificially matured."

I have examined 200 cataracts which were operated on in this clinic in 1912 and 1913, in order to examine the relationship between maturity of cataract, form of cataract, and the subsequent after-cataract. In this examination all cases of cataract were considered with the exception of the traumatic cataracts, zonular cataracts, and complicated cataracts. The cases were examined with particular view of determining the correctness of Hess's opinion that the frequency of the after-cataract depends upon the method of evacuating the remaining cortical masses.

The method of operation as described in Hess's book is as follows: After making an incision in the sclera at about 1*mm* from the limbus the capsule of the lens was opened by means of a specially constructed curved capsule forceps. As large an opening in the lens capsule as possible was made. The nucleus was then removed by means of pressure with Hess's instrument. The remaining cortical remnants were removed as follows: An instrument shaped like a shovel with a ridge running transversely at one extremity about 4*mm* broad was introduced into the anterior chamber and the lens material was gradually pushed onto the shovel by means of a Daviel spoon working by pressure on the cornea. In most of the cases it was necessary to introduce this instrument only once. The prolapsed iris was then replaced, a small excision of the iris was made at its base, and the operation concluded.

Various statistics show the frequency of operations for after-cataract. Thus, Kuhnt performs an after-cataract operation in 83% of his cataract extractions; in the statistics of Knapp, Pinto, and Voelkers the number of after-cataract operations varies from 61 to 66%. In others the percentage is from 9 to 10. The statistics of Wittmer and Nagano (1910), based on over 600 extractions in this clinic, gave a percentage somewhat over 7%.

According to Kuhnt, a discission is performed (1) in all cases where the vision is less than $\frac{1}{3}$, (2) in cases where the pupillary region is clouded, (3) where it is likely that a secondary cataract will develop, (4) when particular demands are made upon vision.

Hess operates for after-cataract whenever the vision equals 0.3 or is less. In none of the cases is the after-cataract operated

upon by discission but by an operation which consists in complete removal of the after-cataract. This has been performed in all of this series of cases without causing the slightest iritic irritation.

After making a lance knife incision in the sclera, the tip of the knife is depressed and cuts an opening into the secondary cataract; then by means of the capsule forceps with careful traction the remaining capsule is withdrawn from the pupillary region. When the cases are complicated and the capsule is adherent and there are organized exudates, an incision is made with de Wecker's scissors.

Operations for after-cataract were performed in 24. Of these 3 must be excluded from these statistics on account of choroidal changes in the macula in 2, while in one with a vision 0.4 an after-cataract operation was decided upon because the profession of the patient demanded greater vision. The remaining 21 operations for secondary cataract are distributed as follows:

Forms of cataract	Number	Number of After-cataract Operations
Cataracta senilis totalis	96	9
" incipiens	60	5
" totalis with heterochromia	4	1
" incipiens with heterochromia	1	0
" intranuclearis	25	2
" zonularis	4	0
" nigra	2	1
" complicata	8	3

After subtracting the operations in the complicated cataracts, 18 operations remain for after-cataract, in other words, 9.3%.

In the senile cataracts which were mature the percentage of after-cataract operations was 9.3, while in the immature senile cataracts the percentage was 8.3.

If we analyze the frequency of after-cataract according to the degree of lenticular opacity, we find that in 100 cases with complete cortical opacity an after-cataract operation was necessary in 10; in 92 cases with incomplete cortical opacity in 8; in 8 cases of complicated cataract in 3.

This shows that opposed to the generally accepted opinion, cataracts with only partial opacity of the cortex, if operated

on according to the above methods, are not followed more frequently, in fact less frequently, by the formation of a secondary cataract.

In 48 cases of the 100 cataracts with complete opacity large cortical remnants were removed by the shovel, while in 92 cases with partial opacity of the lens a large amount of cortical remnants was only present in 10. The percentages, therefore, are 48% and 10.8%. In the cases of mature cataracts which led to a secondary operation, as well as in the cases of immature cataracts which led to a secondary operation, in about one half of the cases in each was a large mass of cortex removed by means of the shoveling maneuver. Of the 8 after-cataracts in the second group there are 3 cases in which in 2 on account of high myopia and in one on account of a section which was too small, the extraction of the lenticular masses could not be completely carried out.

KERATECTOMY.

By Dr. CAMILLO FORONI, Genoa.

Translated from the *Archiv f. Augenheilkunde*, Vol. LXXVIII, No. 4.

KERATECTOMY is an operation which I perform in corneal abscesses (hypopyon-keratitis). It is also applicable in the treatment of rodent ulcers as well as all forms of deep keratitis which resist the ordinary treatment, heal but slowly, and result in pronounced anatomic and functional disturbances in the eye. I have within the last four years operated upon 200 cases. In all cases the results have been so exceptionally good that I regard the operation as an unusually thankful therapeutic innovation.

To show its value even in advanced cases, I wish to report upon the following:

A man 64 years of age, in very poor general health, presented an extensive corneal abscess in the left, his only eye, following an injury with a piece of stone 24 days previously. The purulent infiltration had involved all but one fifth of the cornea. The anterior chamber was normal. An active trachoma was present. It did not seem to me that our usual methods of treatment—a Saemisch incision, the galvanocautery, or any of the other usual medicinal or operative measures—would be of any avail. Keratectomy in this case succeeded in bringing the abscess to a standstill. The purulently infiltrated cornea did not disintegrate and preserved its normal structure. The peripheric free part of the cornea remained transparent and the extensive part of the cornea which was involved healed with a slight clouding through which the iris could be seen. A month later an optical iridectomy was performed which enabled the patient to find his way about alone.

In these cases, if the iridectomy is performed with the lance

knife or with the Graefe knife, it is well known that the corneal flap becomes cloudy from insufficient nourishment and the level of the cornea is apt to be changed. To prevent this I have practiced the following modification: I dissect down a broad conjunctival flap which exposes the sclerocorneal region and then introduce the point of the Graefe knife through the sclerocorneal region into the anterior chamber.

Keratectomy has also given us an excellent result in cases where the purulent infiltration has involved three fourths of the cornea and the lacrimal sac shows purulent discharge. In these cases I am in the habit of first treating the dacryocystitis and then the corneal abscess, and have observed after the first operation and within twenty-four hours the arrest of the purulent infiltration and the signs of beginning healing, although the cornea and the conjunctiva were still bathed in pus.

Keratectomy is based on the most elementary principles of general surgery. The following instruments are necessary: speculum, fixation forceps, a forceps with very fine mouse-teeth, a sharp knife, spatula, thin pair of scissors, sharp curette, hooks, and Desmarre's scarificator. If the corneal abscess or the infected ulcer is surrounded by a secondary infiltration or accompanied by hypopyon, the infiltrated parts are outlined with the tip of the Graefe knife. The knife is introduced at right angles to the surface of the healthy cornea at as short a distance away from the diseased part as possible. The depth of the incision depends on the thickness of the cornea. It is self-evident that only the superficial layers can be divided. The inner margin of the wound is then grasped with the forceps or with the hook and the entire cornea within the incision is carefully dissected off. Care must be taken not to penetrate the anterior chamber or to expose Descemet's membrane.

The peripheric part of this corneal defect may show small yellowish infiltrated areas. These must all be carefully removed. With the curette or with Desmarre's scarificator the entire corneal defect is carefully scraped, the wound being continually irrigated. The margins of the defect are then smoothed over with a pair of scissors. The wound is then disinfected with irrigation with a 1:1 000 solution of bichloride of mercury or, better, cyanide of mercury in an Anel's syringe.

The entire conjunctival sac is then irrigated with a 1:5000 to 1:10,000 solution. Atropin is instilled and sterile xeroform applied. To prevent the lids from moving under the bandage, a piece of adhesive plaster is applied to the lids. If the patient is restless during the operation, the eye is fixed by forceps held by an assistant. The healing takes place in from a few days to a few weeks, according to the severity of the disease. The severe inflammatory symptoms and the pain which are always present in these infected corneal ulcers disappear within twenty-four hours, particularly in the mild cases.

In the severe cases it is important to determine the exact site of the inflammatory focus; this is best done by studying the cornea with light coming from different directions or by passing a de Wecker spatula over the cornea. The unevenness of the epithelium usually denotes the exact situation of the focus. The area, as has been described, is carefully circumscribed and all diverticula and extensions are excised.

The second part of the operation consists in making an incision to the outer side of the leucocytic infiltration which surrounds the original focus. This second incision does not need to be as deep as the first and only the superficial parts are excised, consisting in epithelium, Bowman's membrane, and the superficial corneal lamellæ. This flap may sometimes have to be removed up to the periphery of the cornea and if necessary the surrounding conjunctiva may also have to be removed, particularly if it shows a tendency to grow toward the center of the cornea. The wound is then disinfected and treated as above described. After excising this flap, the corneal lamellæ are less compressed and are under better conditions of nutrition, thus permitting a rapid absorption of the intralamellar exudate.

If the anterior chamber contains exudate which does not seem to be absorbed promptly, it is well after a few days to perforate the cornea in its periphery with the galvanocautery and then to aspirate the pus with Anel's syringe. It is then possible to cause the absorption of thick exudates by keeping the anterior chamber open.

Paracentesis of the anterior chamber with the galvanocautery replaces in all cases the Saemisch section, because the iris is not invaded and the wound in the cornea is a very small one.

Every large wound of the corneal lamellæ as results from perforation or incision attracts a collection of leucocytes which is the beginning of tissue destruction and leads to a more or less dense opacity.

The objection to the use of the galvanocautery in the treatment of the corneal abscesses consists in the addition of additional dead tissue to a deeply seated necrotic focus which prevents the direct action of the remedies. The purulent focus in addition must be attacked from its periphery so that the surrounding healthy tissue also suffers damage and an extension of the destructive process frequently invades this healthy tissue. These objections are not present in keratectomy. Another great advantage is the slight corneal opacity which remains. The tissue which has been excised is replaced by nearly transparent tissue and consists probably of true new-formed corneal elements.

REPORT OF THE TRANSACTIONS OF THE SECTION ON OPHTHALMOLOGY OF THE ROYAL SOCIETY OF MEDICINE.

By H. DICKINSON, Esq.

The first meeting of the Session was held on November 1, 1916, Mr. William Lang, F.R.C.S., President, in the chair.

In his inaugural address, the President advocated the appointment of a small Committee to initiate and organize research, with, perhaps, a bureau for collecting details of rare cases. In this way a quantity of valuable material would be available for research scholars, or for a Committee appointed to make use of it. Further, a card-index system for recording all literature bearing on the science of Ophthalmology in the United Kingdom would be very valuable. At present pathological confirmation of the findings of clinical observation on an adequate scale was lacking, especially in regard to septic foci as the cause of many eye diseases. With the Society's excellent laboratory, it only needed a system of subsidized workers. This could well be the occasion for joining with other bodies in a crusade to instruct the nation in the cultivation of right habits, notably in regard to clean mouths. The same purpose ran through all this effort: to decrease by British effort the power of every disease.

Mr. G. Winfield Roll showed a case of **congenital pigmentation of the optic disk,** in a subject of glycosuria. The right eye was affected with retinitis: the vessels in the remainder of the fundus were normal.

Mr. Leslie Paton exhibited a case of **pigmented plaque of the cornea,** of obscure nature, though he inclined to the view that it was melanotic sarcoma. There was a peculiar separation of the fibers of the iris. Mr. Mayou thought it was the

appearance which would be produced by an injury, but there was no history here of trauma. The PRESIDENT thought it was an anterior synechia, and recommended inspection with a stereoscopic apparatus.

Dr. FREDERICK E. BATTEN showed a child with **pigmented degeneration of the retina,** associated with epileptic fits. The sight had failed somewhat rapidly during the past year, and a central scotoma in both eyes had been demonstrated, somewhat to the temporal side. There was also optic atrophy, and some pigmentary disturbance at or near the macula. Physical examination of the nervous system was negative. The father was syphilitic, but this patient showed no trace of that disease. The case was discussed by Mr. PATON, Mr. RAYNER D. BATTEN, Captain ORMOND, Mr. MAYOU, Mr. PARSONS, and the PRESIDENT.

Mr. N. B. B. FLEMING showed a case of **retinitis circinata,** with changes in blood-vessels, and Mr. A. C. HUDSON exhibited a new small speculum.

Lieut.-Colonel and Mrs. R. H. ELLIOT submitted a contribution on the photography of macroscopic eye specimens, its object being to help those who desired to photograph such specimens. The authors regarded the following points as of importance: (1) The photograph must be taken in water, without the intervention of glass or other similar material. (2) The source of light must be good and even. (3) The camera must be placed immediately above the object, to avoid reflexes. (4) The object of the photograph must be so placed that its image will occupy the center of the plate, and a method of adjustment should be available to secure this end with the least inconvenience. (5) A simple arrangement is necessary to fix the eye in position during the whole exposure. (6) To save unnecessary retouching, the object should be photographed lying on a dark and uniform surface, to obviate the background disturbing the attention of those viewing the picture. (7) Care should be exercised in the choice of a camera and exposure-periods must be carefully studied. For the making of lantern slides, the contact method is recommended, and the authors directed attention to the following points: correct exposure, the preparation of plates for exposure, development and fixation of the slides, the drying of the plates,

the reduction and intensification of slides, and the varnishing of them.

Dr. Frank E. Taylor and Mr. Norman B. B. Fleming contributed a paper on a case of **bilateral glioma of the retina with multiple metastases.** The patient was a female child æt. 3 years, in whom an abnormality was noticed in the left eye 18 months previously. On admission, there was a fungating growth protruding between the lids of the left eye, keeping them separate. The mass was bathed with a thin semi-purulent discharge. The right eye was much enlarged, and apparently proptosed: the iris fully dilated, and stretched into a thin band at the limbus, the lens being in contact with the posterior aspect of the cornea. The growth was lemon color. No reflex was obtainable ophthalmoscopically. Mr. Elmore Brewerton (who had allowed him to record the case) operated at once, performing exenteration of the orbit, with partial removal of the lids, afterwards suturing the wound. The right eye was very freely excised. The optic nerve was found to be involved, being surrounded by growth for half an inch behind the eye. A fortnight after her discharge, there was a recurrence, half the size of a tennis ball, from which the patient died. She had shown little evidence of pain. Microscopically, the growths were found to be composed of closely packed small round cells, with large deeply staining nuclei. A few spindle cells were also present. The body was much emaciated, and the metastases were extensively distributed. The author discussed the subject from a general standpoint.

Mr. Arnold Lawson read notes of a case of **recurrent glioma of the retina.** The patient was a boy, æt. 3½ years, and the gliomatous eye was removed. The growth had almost perforated the globe. Mr. R. A. Greeves found a large scleral staphyloma at the front, and it was infiltrated with glioma cells, while masses of growth could be traced along the sheath to the foramen. After remaining well six months, there was a recurrence in the orbital cellular tissues, and evisceration was carried out at hospital. There was a further recurrence, and 90*mg* of radium were applied 4½ hours. Free sloughing followed, and the child was kept in hospital 6½ weeks, at the end of which time there seemed to be no sign of growth. Three months later, however, the patient was readmitted on account

of a fluctuating swelling. It yielded pus at the bottom of which was suspicious pultaceous material. Investigation revealed an extensive recurrence, beyond the reach of either further operation or radium. The child seemed to have a remarkable absence of pain, and seemed fairly comfortable, except towards the end. The paper by Dr. Taylor and Mr. Fleming and that by Mr. Lawson were discussed by Mr. W. C. ROCKLIFFE, Mr. BREWERTON, Mr. PARSONS, Mr. HOLMES SPICER, Lieut.-Colonel ELLIOT, and Mr. TREACHER COLLINS, the last-named calling attention to the different methods of spread of glioma and sarcoma of the orbit. One began in the neural epiblast and the other in the mesoblastic tissue. Sarcoma of the choroid generally spread by metastasis, whereas gliomatous growths spread by continuity, and death occurred from local recurrences, as was shown in a number of cases traced by Mr. Lawford and himself. Lieut.-Colonel Elliot agreed with Mr. Brewerton's operative procedures, speaking from his experience of a number of such cases in India.

REPORT OF THE PROCEEDINGS OF THE SECTION ON OPHTHALMOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

By LEWIS W. CRIGLER, M.D., SECRETARY.

GEORGE H. BELL, M.D., CHAIRMAN. MONDAY EVENING, OCTOBER 16, 1916.

Dr. MARTIN COHEN showed **a case of essential shrinkage of the conjunctiva.** Mrs. C. K.; age 61; previous history negative except an attack of pneumonia nine years ago, which left her heart and lungs somewhat crippled. The patient first complained of her eye condition a year and eight months ago. The symptoms came on gradually and were first evident in the left eye; following in the right eye three weeks later. The process in the left eye was progressive, while in the right eye it was almost stationary for five months.

At present, left eye, S=$\frac{3}{200}$. A moderate mucoid and fibrinous secretion is present; several areas of a slate-colored membrane are visible on the bulbar and palpebral conjunctiva; the caruncle has numerous small yellowish patches of degeneration on its surface. There is slight pain on palpation. The mobility of the eye is slightly limited upward and inward. There is normal sensibility of the cornea and conjunctiva. The lower palpebral conjunctiva is thin and diffusely red, with evidences of superficial cicatrization and shrinkage, causing an obliteration of the lower canaliculus, and moderate ectropion. The cul-de-sac is obliterated. The bulbar conjunctiva was chemotic and partially covered with a fibrinous exudate, and over a small area by a slate-colored membrane. The succulent tissue gradually encroached on and encircled the cornea, leaving—when first seen—a clear circular area of cornea *2mm* in diameter not yet involved; but finally this

area became invaded, leaving in one month no trace of corneal surface. The upper palpebral conjunctiva is thin and congested, with a linear scar in the sulcus. The tarsus is thickened; the fornix, normal.

Right eye S=$\frac{20}{30}$. The fundus normal; the lower conjunctiva and the external examination, excluding the cornea and the bulbar conjunctiva, are similar in both eyes. The bulbar conjunctiva is slightly congested; the cornea is transparent except in the lower third, where a vascular grayish infiltrate is clearly visible; two yellowish brown spots are seen in this area; the upper conjunctiva and fornix are normal. Repeated weekly examinations of the conjunctiva, with aid of corneal microscope and loupe revealed no evidence of vesicles or ulcerations. In March an attack of erysipelas occurred. During this illness the lesion which the patient now has appeared in the roof of the mouth which consists of an hyperæmic area covered with isolated spots of yellowish-white membranous exudates which bleed readily on removal. In August, a single large eruption developed on the left forearm, resulting after a month in cicatrization.

A section of the tissue which covered the left cornea was removed for microscopical examination. The surface of the tissue was devoid of epithelium, and in its place was a thin homogeneous structure. The subepithelial layer consists of a network of œdematous connective tissue stroma with abundance of round cells and a few elliptical cells. Numerous capillaries are also evident in various stages of thrombosis. Necrotic areas are clearly distinguished around some of them. A portion of the tissue removed was also used for inoculation into the inguinal region of a guinea pig. After several weeks the inoculation showed no glandular involvement.

Bacteriological examination of smears from the conjunctiva, mouth, and forearm showed mainly staphylococci.

In conclusion, Dr. Cohen laid emphasis on four points: 1. The absence of vesicles or ulcerations on the conjunctiva. 2. The lack of analogy between this condition and pemphigus of the skin. 3. The absence of distinct evidence of skin pemphigus after a year and eight months. 4. The mouth and skin lesions in this case have been diagnosed differently by several dermatologists. In the absence of definite lesions in

the skin, Dr. Cohen thinks we should apply the term "Essential shrinkage" to this obscure condition.

The case was discussed by Dr. WEEKS, Dr. BELL, and Dr. WEIDLER.

Dr. M. J. LEVITT showed **a case of recurrent paralysis of the right abducens nerve.** Dr. Levitt has had the patient, a young woman, 23 years of age, under observation since last May, since which time he has been enabled to follow the progress of an attack from onset to recovery. The beginning dates back to the time when she was one and one half years old, when during an attack of measles the right eye turned in toward the nose. The interval between the attacks has varied from a few days to thirteen months up to the present time. Previous to the onset of attack patient has a severe headache, chills, and fever; sometimes nausea and vomiting for two days. Patient is confined to bed. When recovery begins patient experiences a peculiar sensation of pressure in the paralyzed eye. There was nothing in her history to account for the trouble. Physical examination was negative.

Discussion: Dr. WOOTTON said that he had seen the case when paralysis was almost complete.

Dr. LESZYNSKY said that he did not consider recurrent abducens paralysis rare but uncommon. He said that a certain percentage of cases of migrain suffer from this affection; also the third nerve may become involved; several theories have been advanced to explain the condition,—one is that it is due to migrain; another is that it is due to a distension of the lateral ventricle which presses upon the foramen of Monro, and if sufficient, may extend to the abducens. The fact that recovery is complete excludes meningitis or any other organized exudate. The prognosis is not always good as the ventricle may eventually become permanently distended.

Dr. LEVITT referred to a case reported by Dr. de Schweinitz, who attributed the paralysis to a patch of pachymeningitis, the exudate from which had become completely absorbed after each attack.

Dr. JOSEPH BRUDER showed **a case of amaurotic family idiocy in a child eight months old.** The case was discussed by Drs. SCHOENBERG, CLAIBORNE, COHEN, and REESE.

Dr. F. W. SHINE showed **a case of vernal catarrh that had**

been treated with radium. For the sake of comparison he treated the right eye with radium, and the left with the usual astringent medication only. The radium was given as follows:

May 24, 1915. Application to right upper lid of 20*mg* of radium, 2,000,000 activity, for 25 minutes.

June 8, 1915. Application to same area for 30 minutes of the same quantity of radium.

June 22, 1915. The same as June 8th.

Nov. 18, 1915. The same as June 8th, for 35 minutes. The cornea was protected in each instance by a metal disk and the radium enclosed in a glass tube covered by thinnest rubber tissue.

At the present time, Oct., 1916. Connective tissue growths have disappeared, the lid is smooth, secretion though present is much less in quantity. Subjective symptoms have greatly improved. The left lid remains the same as it was a year ago.

Dr. Shine said that he had treated four other cases of vernal catarrh with radium. Two cases were pronounced cured after two applications of 60*mg* for 15 minutes. One case required four applications to relieve. He has followed the cases and reports all of them as doing well. He has never noticed any irritation or inflammation of the cornea following the use of radium in these cases.

Dr. WEEKS reported **a case of glaucoma associated with herpes zoster frontalis.** Symptoms of glaucoma developed two weeks after the onset of herpes; tension 47*mm* of Hg; there were no vesicles on the cornea and the iris was not inflamed. Vision was reduced and the tension was not reduced by miotics. Lagrange's operation was performed with the result that tension is now subnormal. Dr. Weeks said that he had seen two other cases similar to this one, and in all three cases the increased tension was on the same side as the herpes. He said that the majority of cases seen had subnormal rather than increased tension. He thinks the explanation for the increased tension might be found in an abnormal amount of colloid or fibrin contained in the aqueous, thus leading to the blocking of the spaces of Fontana.

Discussion: Dr. SCHOENBERG said that Morax in Feb., 1916, had reported two cases. One case had acute glaucoma

when first seen, but the patient had previously been to another oculist who had used atropine in the eye. The second case had chronic glaucoma in both eyes without any clinical symptoms but both disks were cupped. Dr. Schoenberg thought it questionable whether the glaucoma was primary or whether the process stimulated a latent glaucoma.

Dr. WEEKS said that the cases seen by him had shown no previous symptoms of glaucoma.

Dr. WEEKS presented **a specimen of an eye with buphthalmus which he had removed from a child four months old.** The eye had enlarged as the result of complete annular posterior synechia and secondary glaucoma. The tension was increased. Dr. Weeks regarded the condition as due to an intrauterine inflammation.

Dr. WEIDLER reported **a case of spontaneous "explosion of a Snellen eye in the orbit."** The patient had been standing before a hot stove and walked to an open door which led into the yard. It was thought that the sudden change in temperature produced the accident.

Mr. MAX POSER, representative of the Bausch & Lomb Optical Co., presented **a new form of ophthalmic test lenses and portable opto-phorometer.** The principal features of the test lenses are that they are only 15*mm* in diameter, are plano-convex and of uniform thickness, thus causing the principal points to occupy the same relative position. In refracting, the curved surfaces of the spheres are placed toward the patient's cornea; when a cylinder is required, the plano surface is placed in apposition to the plano surface of the sphere; thus at all times the distance between the principal planes of the two lenses is the same.

The details of the opto-phorometer, with the many advantages claimed for it, can best be ascertained from an ocular demonstration of its parts.

The Section regrets to record the death of one of its able and distinguished members, DR. WILBUR B. MARPLE, which occurred on the 30th day of August, 1916.

QUARTERLY REVIEW OF THE PROGRESS OF OPHTHALMOLOGY.

By H. KOELLNER, Berlin; W. KRAUSS, Marburg; R. KÜMMELL, Erlangen; W. LOEHLEIN, Greifswald; H. MEYER, Brandenburg; W. NICOLAI, Berlin; H. PAGENSTECHER, Strassburg; K. WESSELY, Würzburg; and M. WOLFRUM, Leipsic, with the Assistance of Drs. ALLING, New Haven; CALDERARO, Rome; CAUSÉ, Mayence; CURRAN, Kansas City; DANIS, Brussels; GILBERT, Munich; GROENHOLM, Helsingfors; v. POPPEN, Petrograd; TREUTLER, Dresden; and VISSER, Amsterdam.

Edited by MATTHIAS LANCKTON FOSTER, M.D., F.A.C.S., New Rochelle, N. Y.

FIRST AND SECOND QUARTERS, 1916.

I.—GENERAL OPHTHALMIC LITERATURE.

1. ALLPORT, F. **State legislation concerning wood alcohol.** *Ophthalmology*, July, 1916.

2. AUBINEAU, E. **The value of the aphakic eye to the soldier.** *Annales d'oculistique*, cliii., No. 2.

3. BERARD. **The meaning of leucocytosis and polynucleosis in clinical medicine.** *Clinique Ophtalmol.*, vii., 1.

4. COLLINS, E. TREACHER. **Contusion hypotony.** *Ophthalmoscope*, July, 1916.

5. COUTELA, CH. **Permanent disability of ocular origin and indemnity from a military point of view.** *Archives d'Ophtalmologie*, xxxv., 1.

6. EDRIDGE-GREEN, F. W. **Binocular vision.** *Ophthalmoscope*, June, 1916.

7. FERREE, C. E., and RAND, G. **A résumé of experiments on the effect of different conditions of lighting on the eye.** *Annals of Ophthalmology*, July, 1916.

8. GENET, L. **Ophthalmology at the front.** *Lyon Chirurgical*, Nov. 1, 1916.

9. LAGRANGE. **Military indemnity for injuries to the visual apparatus.** *Archives d'Ophtalmologie*, xxxv., 2.

10. MADDOX, ERNEST D. **Note on overstrained eyes and their treatment.** *Ophthalmic Review*, April-May, 1916.

11. DE ST. MARTIN. **Surgical eye cases in an ambulance of advanced position during the first year of the war.** *Annales d'oculistique*, cliii., 1.

12. MAYOU, M. S. **Two cases of paralysis of the sympathetic associated with the cervical rib.** *Ophthalmoscope*, June, 1916.

13. PETER, L. C. **Perimetric studies of the normal and pathological blind spot of Mariotte.** *Annals of Ophthalmology*, April, 1916.

14. SMITH, PRIESTLEY. **Note on the origin of familial and hereditary disorders.** *Ophthalmic Review*, April-May, 1916.

15. VALUDE, E. **Inopportune operations.** *Annales d'oculistique*, cliii., No. 3.

16. WHIPHAM. **Congenital word and letter blindness.** *Ophthalmoscope*, January, 1916.

17. WRIGHT, H. R. **A rare tubercular condition of the eye.** *Ophthalmic Record*, July, 1916.

According to the investigations of ALLPORT (1, **State legislation concerning wood alcohol**) thirty-one States now have laws bearing on the sale of wood alcohol. The first State to pass such a law was Maryland in 1904. The unpurified article is so foul smelling and tasting that there is little objection to unrestricted sale. The same is true of denatured alcohol which is rendered unpleasant by the addition of benzine or pyridine. Purified wood alcohol or Columbia Spirits however should either not be manufactured at all or at least carefully restricted in sale, for its promiscuous use is fraught with danger.

ALLING.

In order to study the effect of the various sorts of illumination FERREE and RAND (7, **Experiments on the effect of different conditions of lighting on the eye**) test the ability of the eye to maintain a certain standard of acuity of vision both before and after reading under the conditions experimented with. As to the types of lighting, they think that those which give a uniform diffuse illumination, such as that given by the indirect method, are most favorable to the eye. The intensity of the light seems to make little difference although in practice too much light is generally employed. The loss of efficiency under unfavorable conditions appears not to be due to retinal fatigue but is rather muscular. They do not approve of eye shades because the retina is unequally illuminated.

ALLING.

PETER (13, **Perimetric studies of the normal and patho-**

logical blind spot of Mariotte) states that the average normal blind spot is 7° 40′ long by 5° 28′ wide and situated 15° 49′ from the fixation point. Variations noted are shortening of the vertical diameter and a greater distance from the macula. The pathologic blind spot first shows a zone of qualitative color loss, then a relative enlargement for colors, and finally an enlargement for form. He discusses conditions which are associated with the phenomenon: congenital defects such as opaque nerve fibers where only qualitative loss is found, myopia where there is enlargement of the globe and pulling away and thinning of the retina with much enlarged blind spot, accessory sinus disease in which condition the observation is of great value as a diagnostic sign especially in the chronic form where the symptoms are slow and insidious, chronic nephritis where the fields are contracted and the blind spot enlarged often before the typical lesions appear, and finally commotio retinæ when the choroid is ruptured or even without visible rupture. The cause of the enlargement is involvement of the peripapillary fibers which probably are located in the periphery of the nerve head. It may also be due to intraocular changes about the nerve.

ALLING.

WHIPHAM (16, **Congenital word and letter blindness**) reports a case of a girl eight years old in which the patient was word and letter blind and letter deaf. She could, however, recognize one or two letters and had some power of writing. There was a positive Wassermann, and the origin may possibly have been syphilitic. He finds it difficult to explain why the right side did not take on the function of the left as it does for motor speech in cases of lesions of Broca's area.

CURRAN.

BERARD (3, **The meaning of leucocytosis and polynucleosis in clinical medicine**) affirms the importance of leucocytosis for the favorable outcome of an infection and recommends the use of "Novitas" or "Tapo" as an agent producing a general leucocytosis.

SCHOENBERG.

EDRIDGE-GREEN (6, **Binocular vision**) says that the perception of binocular relief and solidity is not dependent on the combination of images falling upon the disparate points of the

retinas, although when images do fall upon adjacent disparate points they are combined in their proportion in space.

After quoting two examples to prove this point he says, "It would appear that in ordinary binocular vision the right eye dominates for the right side and the left eye for the left of the combined field unless the position of two points in space be noted, when one eye, usually the right, dominates. The mind projects outwards the appearance of a solid object which would give rise to the images falling upon the retinas."

This brief article should be read in the original.

CURRAN.

SMITH (14, **Note on the origin of familial and hereditary disorders**) says we must assume that damage done to a normal individual is sometimes represented in the offspring by special liability and that an acute exanthem may be the starting point of disease in persons who have no specific liability to it. This liability may be transmitted. Every disorder must have a starting point and when one which is commonly hereditary appears to arise de novo we have perhaps an opportunity of discovering the starting point of a condition which is apt to become hereditary. These opportunities should not be neglected. CURRAN.

MAYOU'S (12, **Two cases of paralysis of the sympathetic associated with the cervical rib**) first case was a girl nine years old with right pupil smaller than the left, and ptosis of the right eyelid. Diminution of sweating on the right side, also enophthalmos. X-ray showed cervical rib on that side.

The second case, female, forty-six years. Left pupil smaller than right, does not dilate with cocaine. Ptosis, diminution of sweating on the right side. X-ray shows cervical rib on the left side. CURRAN.

WRIGHT (17, **A rare tubercular condition of the eye**) enucleated an eye which he had treated for staphyloma of the sclerocorneal region. The affected area had been excised but the condition returned. Frequent paracentesis of the anterior chamber had been performed but was of no avail. When the eye was removed the staphyloma was found to be 8*mm* long, 6*mm* broad, and 3*mm* high. The iris was found lining the thin wall and the tissue proved to be tuberculous.

ALLING.

COLLINS (4, **Contusion hypotony**) remarks on how little attention has been paid to the causes of hypotony. His paper deals with contusion hypotony. He says in the majority of these cases normal tension becomes restored in a few days, in others in several weeks, and in still others it appeared that the lowered tension would be permanent. There are several different ways in which contusion to the eyes may cause lowered tension.

1. Diminished secretion: (a) from nerve inhibition; (b) from vascular disturbance; (c) from epithelial damage.

2. Increased excretion: (a) through normal channels; (b) through new-formed channels.

There may be more than one cause in each case. When of short duration, it is probably due to increased rate of secretion through normal channels; or possibly to arrest of some of the secretion from paresis of the vaso-constrictor nerves. When of long duration it is probably caused by the formation of new channels of exit from the anterior chamber; the internal scleral rupture or rupture of the pectinate ligament; the cutting off of the blood supply to the ciliary body from rupture of the anterior ciliary arteries; or the detachment of the pars ciliaris retinæ. If accompanied by extensive hemorrhage into the anterior chamber, the canal of Schlemm, the sclera, or the ciliary arteries may be ruptured.

This is a very interesting paper and each phase is discussed in Collins's usual clear and comprehensive style.

CURRAN.

VALUDE (15, **Inopportune operations**) insists that no inopportune operations, like an extraction of a traumatic cataract, or an advancement for strabismus, should be performed on the eyes of soldiers during the war.

SCHOENBERG.

AUBINEAU (2, **The value of the aphakic eye to the soldier**) says that soldiers with traumatic cataract in one eye ought to be operated as soon as possible, in order that they should be restored to active service.

SCHOENBERG.

COUTELA (5, **Permanent disability of ocular origin and indemnity from a military point of view**) says that a new law ought to be passed in France, for the benefit of the blinded

soldiers, more in accordance with the provisions of the compensation law for industrial accidents.

SCHOENBERG.

GENET says in his paper (8, **Ophthalmology at the front**) that 6% of the soldiers with serious eye injuries have lost both eyes and 15% have lost one eye. In a number of soldiers the bullets had entered one temple and made their exit through the other, injuring both optic nerves, the patients remaining absolutely conscious. The eyeballs, when struck by bullets, were torn at three points, at the point of entrance, exit, and the third tear was produced by the bursting of the eyeball from a sudden increase of the intraocular pressure. Bullets in the orbital tissue and orbital phlegmons were rare. The injuries of the cortical visual area and of the central optic paths were frequent. He relates four cases of hemianopsia produced by the perforating wounds of the cranium. The hemianopsias were simple and accompanied by hemiplegia, aphasia, and prolapse of the brain substance in the wound.

Another group of cases reported contains those with only tangential injuries of the occiput. The outer plate of the bone remained intact. The patients are not aware of their visual troubles and their hemianopsia has to be searched by careful perimetry. Trephining reveals a crack in the inner plate of the occiput and extensive hemorrhages under the dura and an extensive injury of the brain substance. The author advises operative interference in all such cases and reports the post-mortem findings in one who, though trephined, died and revealed at the autopsy a large hemorrhage under the dura which had not been opened during the operation.

SCHOENBERG.

LAGRANGE (9, **Military indemnity for injuries of the visual apparatus**) is in favor of an indemnity for war injuries of the eyes more liberal than that provided by the existing French laws.

SCHOENBERG.

DE ST. MARTIN (11, **Surgical eye cases in an ambulance of advanced position during the first year of the war**) finds that 1.36 per cent. of 4163 wounded soldiers had eye injuries and about 0.5 per cent. had penetrating wounds of the eyeball. All these eyes had to be enucleated. The author lays great

stress upon the earliest possible X-ray examination of the wounded eyes, since only the immediate removal of the foreign body from the globe may prevent infection and save the eye from enucleation.

SCHOENBERG.

MADDOX (10, **Note on overstrained eyes and their treatment**) says that the most important of the symptoms of eye strain is a slight increase in the intraocular tension. This predisposes to glaucoma, which by early treatment could be prevented. There is no cupping of the disk or diminution of the field, unless of the spiral fatigue character, though the disk is often hyperæmic.

He lays stress on the importance of complete rest of the eyes. Fatigued eyes exhibit less resisting power to cold and other stimuli. Eyestrain should be recognized as a pathological entity.

Sponging the eyes with hot water would, he says, act in three ways: First, by relaxing the fibrous tissues slightly; secondly, by dilating the arterioles and lymphatics; third, by the diminished internal friction in the aqueous humour. The mobility of water is increased by warmth.

In some cases dieting, eliminating, open-air life, and massage may help.

CURRAN.

II.—RELATIONS OF OPHTHALMIC TO GENERAL DISEASES, INCLUDING POISONS.

18. COWPER, H. W. **Case of wood-alcohol retrobulbar neuritis.** *Ophthalmic Record*, September, 1916.

19. DANIELS, C. W. **Eye lesions as a point of importance in directing suspicion to possible trypanosome infection.** *Ophthalmoscope*, December, 1915.

20. JACKSON, EDWARD. **Intraocular tuberculosis.** *Ophthalmic Record*, January, 1916.

21. MCCOOL. **Some observations on ocular tuberculosis and its treatment.** *Ophthalmic Record*, January, 1916.

22. POSEY, W. C. **A consideration of some of the ocular conditions dependent upon tuberculosis and gonorrhea.** *Ophthalmic Record*, January, 1916.

23. RIESMAN, D. **Soft eyeball in diabetic coma.** *Journal of the American Medical Association*, January 8, 1916.

24. SHAHAN, W. E. **A case of quinine amblyopia.** *American Journal of Ophthalmology*, May, 1916.

25. SLOCUM, G. A. **A study of ophthalmoscopic changes in nephritis.** *Journal of the American Medical Association*, July, 1916.

26. WALKER, C. W. **Herpes of the cornea as a complication of influenza with report of a case.** *Ophthalmic Record*, June, 1916.

SLOCUM'S (25, **Ophthalmoscopic changes in nephritis**) paper is largely statistical. He points out the fact that all cases of hypertension and practically all of chronic interstitial nephritis have œdema of the retina indicating that the condition is rather vascular than nephritic in origin. Œdema occurred quite as regularly in cases of nephritis without high tension. All cases of chronic interstitial nephritis with swollen disks were found in cases of increased blood pressure. Vascular changes were present in all cases of choked disk, in parenchymatous nephritis, and in half the cases of interstitial nephritis. Hemorrhages were found distributed among chronic interstitial, chronic parenchymatous, and hypertension cases, as were endarteritis and tortuous veins.

ALLING.

In WALKER'S (26, **Herpes of the cornea as a complication of influenza**) case the ulcers did not appear until about three weeks after the onset of the facial herpes but they healed unusually quickly (ten days).

ALLING.

DANIELS (19, **Eye lesions as a point of importance in directing suspicion to possible trypanosome infection**) emphasizes the importance of eye lesions as one of the diagnostic signs of infection with trypanosome. In some cases the patient comes to the doctor for the eye lesions alone. A sign which is not uncommon is œdema of one or both lower eyelids. He mentions a case in which there was slight photophobia and iridocyclitis in which the eye trouble led him to take medical advice. The early symptoms may be so slight as not to attract the attention of the patient. He tabulates grounds for suspicion as follows:

1. Continued pyrexia, which does not yield to quinine.
2. Enlarged glands, usually cervical.
3. An erythematous circinate rash.

Of these the last is of most value for diagnostic purposes, and is usually, but not always, present in the early signs.

4. Ocular symptoms (often absent throughout).

5. Orchitis (often absent throughout).
6. Delayed pain after deep muscular bruising (very variable).
7. Cardiac irritability and weakness.

CURRAN.

RIESMAN (23, **Soft eyeball in diabetic coma**) in three cases of diabetic coma found much reduced tension in two. This phenomenon has been occasionally observed before and has been thought to be a sign of fatal issue. The injection of various salts experimentally has showed that such an effect may be produced. It is not due to changes in blood pressure.

ALLING.

JACKSON (20, **Intraocular tuberculosis**) points out the fact that the diagnosis of ocular tuberculosis should not rest on the finding of the tubercle bacilli in the lesion, since it is commonly not found. The best test is repeated injections of old tuberculin, especially if it is accompanied by focal reaction. Typical miliary tubercle of the choroid is found associated with tuberculous meningitis but in its last stages. Recurring hemorrhages of the retina in youth, retinitis proliferans, and massive exudate into the retina are probably tuberculous. He thinks that tuberculin is often given at too frequent intervals and believes that all reaction should have subsided before the injection is repeated. ALLING.

POSEY (22, **Ocular conditions dependent upon tuberculosis and gonorrhea**) says that in cases of metastatic gonorrheal conjunctivitis the gonococcus is rarely found. He states that the inflammation often begins at the external angle of the lids as a serous œdema with muco-purulent discharge and then becomes principally localized in the retrotarsal folds. Gonorrhea as the cause of iritis is often overlooked, but he thinks that rheumatism also is a frequent cause. When the two are associated the cases are unusually severe. His experience with gonococcic vaccines has been unsatisfactory—in fact he believes that they sometimes do harm. ALLING.

After some generalizations on the subject MCCOOL (21, **Ocular tuberculosis**) related nine cases of tuberculosis, including affections of the lids, conjunctiva, sclera, cornea, iris, ciliary body, and choroid.

ALLING.

COWPER (18, **Wood-alcohol retrobulbar neuritis**) saw a woman who gave evidence of wood-alcohol poisoning three months before. The left eye showed temporal atrophy and absolute central scotoma with color field contraction. The right eye gave no sign of abnormality except slight contraction of blue and red fields. The vision was R. $\frac{20}{20}$; L. $\frac{20}{200}$. In examining reports of 200 cases he found none in which the two eyes were not affected, although one was often more involved than the other. ALLING.

SHAHAN'S (24, **Quinine amblyopia**) patient had been given an ounce of quinine and an ounce of ergot during six hours. Eighteen days later there was bare perception of light, pupils were elliptical but responded promptly. The retinal vessels were very small. She was given nitrate of amyl. One month after, the vision had increased to R. $\frac{10}{15}$, L. $\frac{20}{40}$ with the vessels still small, fields contracted, disks pale, and blue-green blindness.

ALLING.

III.—GENERAL AND EXPERIMENTAL PATHOLOGY AND TREATMENT.

27. CLAPP, C. A. **A report of six cases treated with tuberculin, including cases of keratitis, choroiditis, and cyclitis.** *Annals of Ophthalmology*, July, 1916.

28. CLARK, W. L. **The uses of the desiccation method in ophthalmology, with special reference to epitheliomas of the lids, canthi, and conjunctiva.** *Journal of the American Medical Association*, July, 1916.

29. EDMUNDS, WALTER. **Double cataract following experimental total thyroidectomy in a dog.** *Ophthalmoscope*, March, 1916.

30. EDMUNDS, WALTER. **Eye affection following experimental thyroidectomy.** *Ophthalmoscope*, June, 1916.

31. HECKEL, E. B. **Epibulbar sarcoma. Report of a case with new technic for use and treatment with X-rays.** *Annals of Ophthalmology*, July, 1916.

32. RIDLEY, N. C. **Pneumococcal infection of the eye.** *Ophthalmoscope*, May, 1916.

33. SCHOENBERG, M. **Intracranial treatment of syphilitic and parasyphilitic optic nerve affections; physiological evidences; researches on intravital staining of the optic nerve.** *Journal of the American Medical Association*, June 24, 1916.

34. TERSON, A. **Dionin as a reagent to disclose death.** *Annales d'oculistique*, cliii., 3.

35. TRAQUAIR, H. M. **Local anæsthesia in enucleation of the eyeball.** *Ophthalmic Review*, April–May, 1916.

TERSON (34, **Dionin as a reagent to disclose death**) recommends the use of dionin for this purpose, because a minute amount of the powder applied to the conjunctiva will produce chemosis and redness only in living persons.

SCHOENBERG.

According to SCHOENBERG (33, **Intracranial treatment**) it is established that most substances introduced into the blood do not reach the cerebrospinal fluid because the choroid plexuses act as an impermeable filter. He has also shown, by experiments on animals, that the direction of flow in the brain and spinal cord is such that injections into the spinal cord do not reach the brain or optic nerve. He found that with intraventricular injections pigment was discovered, without exception, in the optic nerve. If we grant that syphilitic, tabetic, and paretic atrophies are not toxic but due to interstitial inflammation caused by the presence of spirochætes, intraventricular injection seems the only method of bringing medication into direct contact with the optic nerve.

ALLING.

RIDLEY (32, **Pneumococcal infection of the eye**) says that when the deeper structures of the eyes are attacked by a micro-organism, cultures should be made from the blood and a routine examination of all the sources of infection should be made.

If one organism preponderates and a vaccine from this gives a reaction, the cause of the trouble is obtained. In a case of pneumococcus one attack tends to render the patient more susceptible to another and as long as the septic focus remains constant, relapses and crises will occur.

CURRAN.

CLAPP (27, **Eye diseases treated with tuberculin**) concludes that tuberculous eye lesions are not so rare as formerly supposed; that a case which shows focal reaction is almost certainly tuberculous. Improvement is most noticeable after slight focal reactions occur. Whereas tuberculin is dangerous in internal conditions the reaction can be observed in eye lesions and hence graduated accordingly.

ALLING.

CLARK (28, **Desiccation method of treatment**) uses a fine needle heated by the electric current to a temperature just

short of that sufficient to carbonize. The needle need not necessarily penetrate the tissues but may be brushed over it. The advantages of this method over surgical operations are: thoroughness, better cosmetic results, no sutures, and the possibility of repeating treatments; over radium, usually one treatment, better standardization of dosage, action is confined to the lesion, and more constant effects; over cautery, carbonic snow, etc., more precision and thoroughness, conservation of surrounding tissues, less reaction. He has operated upon 186 cases of various lesions. In 84 cases of epithelioma he claims 96.8% have apparent cures, no recurrences in one year or more being basis.

ALLING.

HECKEL (31, **Treatment of epibulbar sarcoma with X-rays**) treated a patient who had a recurrent sarcoma at the limbus, with the Roentgen rays applied through a lead glass tube. The exposures were from three to six minutes and at intervals of about three days for over fifty times. A small recurrence a few months later was similarly treated and there has been no return. The report is made after five years have elapsed.

ALLING.

TRAQUAIR (35, **Local anæsthesia in enucleation of the eyeball**) reports twenty-seven cases in which he used local anæsthesia. He states his conclusions as follows:

1. The best method to obtain anæsthesia for enucleation of the eyeball is by peri- and post-ocular injections.

2. The condition of the eyeball need not be taken into consideration.

3. Only children and possibly some exceptional cases in adults are unsuited for this operation.

CURRAN.

EDMUNDS (30, **Eye affection following experimental thyroidectomy**) finds that in sixteen experiments in which thyroid or parathyroid excision was done there were eye affections which were probably caused by the operation. In several cases a ground-glass appearance was noted, which often passed on to ulceration.

In some of the experiments the operation consisted in excising only the thyroid lobe with its parathyroids; on the other side the nerves supplying that lobe and its parathyroids

were excised. In nineteen of these experiments three died, two had symptoms from which they recovered, and the remaining fourteen had no symptoms.

In five of the nineteen experiments the eyes were affected.

This percentage is higher than when simple total excision was made and seems to prove that altered secretion of the thyroid and parathyroid produced by severing their nerves is more inimical to the nutriment of the cornea than any factor produced by complete excision of the glands.

Other observers have noticed similar eye changes, such as intense conjunctivitis, opalescent cornea, conical cornea with ulcer of the apex of the cone, acute blepharitis with much secretion.

Edmunds holds that Graves's disease, if not too mild or too severe should be treated by partial excision of the goiter.

CURRAN.

EDMUNDS (29, **Double cataract following experimental total thyroidectomy in a dog**) reports a case of double cataract following an operation in which both the thyroid and the parathyroid glands were removed.

CURRAN.

IV.—REMEDIES, INSTRUMENTS, AND OPERATIVE TECHNIC.

36. DANIS, M. **Operation to restore the lower conjunctival sac.** *Annales d'oculistique*, cliii., 2.

37. DARIER, A. **Optic atrophies, the hypophysis, and the X-rays.** *Clinique ophtalmologique*, vii., 2.

38. GIFFORD, H. **The desirability of using myotics as adjuvants to mydriatics.** *Journal of the American Medical Association*, July 8, 1916.

39. HINE, MONTAGUE L. **Some observations with the Schiötz tonometer on the normal eye.** *Ophthalmoscope*, July, 1916.

40. LAFONT, A., DUPONT, V., and HECKENROTH, F. **The treatment of eye diseases with simple or mixed serums.** *Clinique ophtalmologique*, vii., 1.

41. PARKER, W. R. **The use of vaseline in cutting and open-air treatment of Thiersch grafts.** *Ophthalmic Record*, March, 1916.

42. RAY. **A new operation for the retention of a movable stump as a substitute for enucleation.** *Ophthalmic Record*, April, 1916.

43. VALUDE, E. **A simple procedure for enucleation.** *Annales d'oculistique*, cliii., 2.

44. WEIDLER, W. B. **The present status of tuberculin therapy in ocular tuberculosis.** *Ophthalmology*, January, 1916.

In view of the fact that glaucoma occasionally occurs after the instillation of a mydriatic, GIFFORD (38, **The desirability of using myotics as adjuvants to mydriatics**) thinks that eserine should always be given immediately afterward and that the patient should be instructed to use it until the pupil is of normal size. ALLING.

LAFONT, DUPONT, and HECKENROTH (40, **The treatment of eye diseases with simple or mixed serums**). In the hot and dusty climate of Senegal where the authors are practicing, the conjunctivæ, lids, and corneæ are very frequently affected and the process is very resistant to the usual line of treatment. They report the histories of forty-nine patients with chronic conjunctivitis, phlyctenular keratitis, and ulcers of the cornea and hypopyon which have been healed in a surprisingly short time by the use of plain horse serum or of anti-diphtheria, -tetanic, -streptococcic, -pest serum. The method of administration was by subcutaneous injections and by local application, as drops in the conjunctival sac.

SCHOENBERG.

WEIDLER'S (44, **Tuberculin therapy in ocular tuberculosis**) personal experience is based upon a series of 117 cases of tuberculosis, and it is interesting to note that in every case in which the diagnostic use of tuberculin was positive, the treatment was successful. The von Pirquet and subcutaneous tests of 0.5*mg* were employed for diagnosis. He has seen very few cases of focal reaction and it is not essential for diagnosis. Phlyctenular ophthalmia he believes to be due not directly to the action of the tubercle bacilli but to tuberculous toxins. For therapeutic purposes he uses the bacillary emulsion and very rarely gets severe reaction.

Tuberculin treatment in connection with proved methods is indicated in all suspected cases especially miliary and conglomerate tubercles of the iris and ciliary body and tuberculous lesions of the retina and choroid. ALLING.

HINE (39, **Some observations with the Schiötz tonometer on the normal eye**) records the results of observation on the intraocular tension on twenty-six children with normal eyes. Intraocular pressure was taken with the patient gazing at the ceiling, with the same eye gazing at an object twelve inches from the nose, the same eye under the influence of eserine, the

intraocular pressure of normal eyes at varying intervals after the removal of the pressure bandage.

A table of these pressures under the varying circumstances is given. The normal pressure was found to vary from 18.5*mm* Hg.-29.5*mm* Hg., the mean being 23.5*mm* Hg. That is the normal intraocular pressure. The intraocular pressure during convergence from 2*mm*.-10.5*mm* Hg., the mean being 4.9*mm* Hg. The intraocular pressure of eyes under the influence of eserine in twenty-two out of twenty-six cases was diminished 2.25*mm*-7.25*mm* Hg., the mean being 4.6, while in the remaining four cases it was unaltered. The intraocular pressure of normal eyes after the application of the pressure bandage varied according to the eyeball. The application for an hour and a half was efficacious in reducing the pressure as one used six hours. The pressure regained its normal level in normal cases examined in from 25 to 60 minutes.

Hine suggests that there should be uniformity as to the method of fixing the eye in using the tonometer.

CURRAN.

DARIER (37, **Optic atrophies, the hypophysis, and the X-rays**) says that recent observations have proved that X-ray treatment of tumors of the hypophysis bring about a recession of the tumor and with it an improvement in vision and of the general condition. The X-rays seem to have a selective action upon the cells of the neoplasm, and according to Darier the results are superior to those of surgical treatment, which at best is a palliative and incomplete procedure. Recourse should be made to surgery only after X-ray treatment has been thoroughly tried. Of course, radiographic treatment is more effective in the incipient stage, before complete optic atrophy has taken place.

Darier reports three observations of which only one is complete. This relates to a patient 46 years of age with acromegaly and vision O. D. $\frac{4}{5}$, and O. S. $\frac{1}{10}$. Field: incomplete bitemporal hemianopsia. Radiography showed the characteristic changes in the region of the sella turcica. After two months of X-ray treatment the vision in the left eye was $\frac{1}{3}$ and two years later it had reached $\frac{4}{5}$. The field of vision and sexual impotence improved also a good deal.

SCHOENBERG.

DANIS (36, **Plastic operation**) describes a modification of Snellen's method for the restoration of the lower conjunctival sac. He constructs a pediculated cutaneous flap in the temporal region, turns it over to the lower fornix, and sews its margins to the lacerated margins of the palpebral conjunctiva.

SCHOENBERG.

PARKER (41, **Use of vaseline in skin grafting**) suggests that the skin and knife be smeared with vaseline so as to eliminate the movement of the skin when the graft is cut. He surrounds the grafted area with a roll of gauze and covers it with a concave perforated aluminum shield.

It is evident that the grafts are less likely to be misplaced with this dressing.

ALLING.

VALUDE (43, **A simple procedure for enucleation**) uses a double forceps with which he grasps the eyeball on both ends of the cornea. He first severs the external rectus from its insertion on the globe and sections the optic nerve right after; the other muscles are then rapidly cut at their insertion.

SCHOENBERG.

RAY (42, **Substitute operation for enucleation**) has devised an ingenious modification of the fat implantation operation. He first cuts out the cornea at the sclerocorneal junction and removes the entire contents of the eyeball. He then cuts out a disk about *20mm* in diameter at the posterior pole, including the optic nerve. A piece of fat from the abdomen is inserted within the sclera and three sutures bring the sclera and conjunctiva together. The muscles are thus retained with their original insertions. In the nature of the case, an artificial eye can have but limited motility, and the reviewer has found that fat enclosed in Tenon's capsule without suturing the muscles together gives practically all the motion of which a shell is capable and it is the simplest operation.

ALLING.

V.—THE SENSE OF SIGHT AND THE VISUAL FIELD.

45. MARIE, PIERRE, and CHATELIN, CH. **Visual disturbances produced by gunshot injuries of the intracerebral course of the optic nerve-fibers.** *Bulletins et Mémoires de l'Académie de Médecine*, 1915, p. 535.

46. MORAX, V. **Hemianopsia produced by contusion of the cranium.** *Annales d'oculistique*, cliii., 3.

47. VILLARET, M., and RIVES, A. **Homonymous bilateral hemianopsia as the only remains of grave injury of the occipital lobe.** *Paris Médical*, January, 1916.

MORAX (46, **Hemianopsia produced by contusion of the cranium**) has seen two patients who have been struck tangentially in the occipital region by fragments of shells or bullets. There was only a contusion or depression of the bone. Ophthalmologically had the patients either a complete blindness or hemianopsia, surgically they were a problem as to the advisability of an operation. Morax advised against surgical intervention because the clinical appearance, the eye symptoms, and their evolution pointed to a contusion of the occipital lobe and subcortical hemorrhages which could not be benefited by trephining the skull.

SCHOENBERG.

VILLARET and RIVES (47, **Homonymous bilateral hemianopsia from injury to the occipital lobe**). This condition has been observed six times during two months in Grasset's service. One patient had a quadrant in the superior field and another a transitory hemianopsia. In two cases the bullet traversed the two hemispheres and all the disturbance that was left was vertigo and hemianopsia. The quadrant hemianopsia has to be searched with care; it can be missed very easily. The discovery of bilateral hemianopsia is of very great importance to the soldier as to his future incapacity and for the purpose of fixing the indemnity due him. A superficial examination misses this condition and acts seriously on the just claims of the unfortunate victim.

SCHOENBERG.

MARIE and CHATELIN (45, **Visual disturbances produced by gunshot injuries of the intracerebral course of the optic nerve-fibers**) found that wounds of the temporo-parietal region may involve the optic radiations and that those of the occipital region injure, almost always, the visual sphere. Perforating wounds of the occipital region injuring the visual fibers and cortex give a variety of visual disturbances like cortical blindness, inferior hemianopsia, quadrant hemianopsia, various kinds of single or multiple hemianopic scotomas. These disturbances have to be carefully searched by perimetry because the patients are often utterly ignorant of their exist-

ence. They present in common a few characteristic points, namely they are symmetrically arranged in the field of each eye, are hemianopic and homonymous and correspond to a lesion which is unilateral and on the opposite side.

The absence ot fundus changes and of symptoms suggesting an optic-tract involvement, the presence of disturbances, due to lesions of the parietal and temporal regions, the seat and direction of the wound, and, finally, the radiograph establish the localization of the lesion in the visual cortical centers and fibers on a firm foundation.

Out of 300 cases of gunshot wound of the cranium the authors discovered characteristic disturbances of the visual field in 30 patients and classified them under the following groups:

1. *Cortical blindness*, following a severe bilateral injury of the occipital region. The patient has only perception of light, and the vision returns gradually after days, weeks, or even months, but the field remains extremely contracted. In the majority of other types the patients may begin with cortical cecity but regain their vision after a few hours or days and remain with some type of hemianopsia.

2. *Inferior hemianopsia*, very rarely met with in times of peace, is found in soldiers with wounds above the occipital protuberance in the median line. A total cecity follows the injury but it soon begins to clear up from above. Perimetry shows a total loss of vision on the lower half of the field which is not exactly limited by the horizontal meridian.

3. *Lateral homonymous hemianopsia* found in injuries of the temporo-parietal lobe and of the optic radiations.

4. *Hemiachromatopsia* (very rare). Only in one case was there an absence of color perception in the left side of visual fields.

5. *Quadrant hemianopsia*, occupying a quadrant on the same side of both visual fields. Such field disturbances have been attributed to lesions of the optic tracts and geniculate bodies. The authors have seen five patients with this type of hemianopsia, all with quadrant in the inferior part of the field. Radiography helps to localize the lesions in the upper margin of the calcarine fissure on one side of the brain only. This throws considerable light upon the question of the dis-

tribution of the nerve-fibers coming from the upper part of the retina. It shows that the superior half of the retina is projected on the superior margin of the calcarine fissure.

6. *Hemianopic scotomas*, the most frequently met (twelve cases). Absolute and negative; vary in size and location; some are central, others, both central and paracentral, and still others peripheral. Some are simple, others multiple, homo- or hetero-lateral; in one case there were three scotomas on the right and hemianopsia on the left side of the field. These scotomas are characterized by being homonymous and constant as to shape and size. These points differentiate the lesion from a peripheric process of the maculæ or optic nerves. The injuries were in the occipital lobe. Some of the patients complained of headaches, vertigo, trouble of orientation, and had symptoms of irritation of the visual sphere (scintillant scotoma, migraine ophtalmique).

The authors believe that their observation proves conclusively that the cortical center of vision is localized in the calcarine fissure and area immediately adjacent. Their findings confirm Henschen's classical studies on the retinal projection on the cortex. The superior quadrant of the retina is projected on the superior margin of the calcarine fissure of the opposite side, so that a destruction of the latter causes inferior hemianopsia. Marie and Chatelin derive definite surgical indications from their very interesting study:

(1) An abnormal field of vision in a gunshot wound of the cranium demands an immediate radiography which in more than half of the cases demonstrates the presence of a foreign body in the brain.

(2) The accurate perimetry serves to discover early enough a process of cerebral suppuration. A rapid enlargement of the scotoma is suggestive of an abscess.

(3) Except for an abscess the presence of a foreign body is no indication for its removal. An operation may result in an extension of the scotoma. SCHOENBERG.

VI.—ACCOMMODATION AND REFRACTION.

48. BOURGEOIS, A. **Correction of anisometropia.** *Annales d'oculistique*, cliii., 3.

49. HOWE, L. **Fatigue of accommodation.** *Journal of the American Medical Association*, July 8, 1916.

50. SCHANZ, FR. **Causes of presbyopia and cataract.** *Clinique ophtalm.*, vii., 1.

51. THOMPSON, A. H. **Late results of operative treatment of high myopia.** *Ophthalmic Review.*

52. VEASEY, C. A. **Chronic infection of the faucial tonsils as a causative factor in the production of paralysis of the accommodation, with report of two cases.** *Ophthalmic Record*, August, 1916.

53. WEEKERS, I. **The astigmatics in the army.** *Annales d'oculistique*, cliii., 1.

54. WILSON, J. A. **Hypermetropia: some extreme cases.** *Ophthalmoscope*, June, 1916, p. 313.

55. WOOD, ARTHUR. **A suggestion as to the cause of myopia.** *Ophthalmoscope*, June, 1916, p. 302.

BOURGEOIS (48, **Correction of anisometropia**) advises the careful and complete correction of anisometropia and training the amblyopic eye. He has seen one patient's vision improving from $\frac{1}{15}$ to $\frac{3}{5}$.

SCHOENBERG.

WILSON (54, **Hypermetropia: some extreme cases**) records a family of five children, three of whom have hypermetropia in extreme degrees; the lenses were not absent. No history of defect of vision in the family other than these:

1. Retinoscopy was in one girl aged eight R. E. $+^{+17}_{+19}$; L. E. $+^{+19}_{+20}$. Vision equals $\frac{6}{18}$ with +14 and +16.

2. Boy, aged seven. Retinoscopy R. E. $+^{+12}_{+13}$; L. E. $+^{+15}_{+15}$. Vision with +10 and +12 = $\frac{6}{12}$.

3. Girl, aged five. R. E. $+^{+13}_{+14}$. L. E. $+^{+16}_{+16}$. Glasses prescribed +8 and +9.

Wilson suggests that these cases might be explained if we had some knowledge of the pedigrees for several generations.

CURRAN.

WOOD (55, **A suggestion as to the cause of myopia**) puts forward the suggestion that the cause of myopia is to be found in the ciliary muscle, which is, as is well known, deficient in Müller's muscle. This defect may be inherited. There is consequently a deficiency in the pumping action of the ciliary muscle, since such patients do not accommodate.

Wood describes the pumping action according to Professor

Thompson's theory of interchange of the aqueous, but does not mention Thompson's name. He advances a very plausible theory as to the cause of myopia. It is, briefly stated, on account of this lack of quick exit of the aqueous that the eye contains more fluid than would normally be the case, and that the gradual increase of fluid must be made room for, and consequently the eyeball is enlarged.

Wood's arguments are well put and very convincing. This paper should be read in the original to be appreciated.

CURRAN.

THOMPSON (51, **Late results of operative treatment of high myopia**) has never had detachment of the retina following any of his operations for high myopia. He thinks it doubtful whether a highly myopic eye is more subject to detachment of the retina after operation than before. He says that operative treatment does not counteract the tendency of the long axis of the eyeball to increase, but it diminishes the effect of lengthening of the axis of the eyeball by about one half.

In the observation of eleven patients for an average period of eight and a half years, he found the average increase of myopia to be 0.3 D. a year while on the unoperated eye it was 0.63 D. per year. CURRAN.

SCHANZ as well as Chalupecky (50, **Causes of presbyopia and cataract**) has found by experimentation on enucleated eyes that ultra-violet rays produce chemical changes in the lens, consisting of an accumulation of insoluble substances. Schanz believes that the changes in the presbyopic and cataractous lenses (consisting of an accumulation of insoluble substances around the nucleus) are due to the chemical action of ultra-violet rays. SCHOENBERG.

VEASEY (52, **Chronic infection of faucial tonsils a factor in the production of paralysis of the accommodation**) reports a case of paralysis of accommodation which had recurred a number of times. The tonsils were buried and contained large crypts. Six days after enucleation of the tonsils the accommodation returned. On former occasions the recovery had been spontaneous. Another case of paralysis of the pupil and accommodation occurred in connection with a severe toxæmia from purulent tonsils. After removal the case recovered.

ALLING.

HOWE (49, **Fatigue of accommodation**) has devised an instrument composed of a horizontal bar on which a test object of small letters is made to slide. The movement is recorded on a revolving drum. In the experiments the letters are brought toward the eye until the accommodation fails, pushed back again, and then the process is repeated. He finds that the near point gradually recedes until the accommodation entirely fails to work.

A line joining the tips of each movement will record the fatigue curve. He thinks that information thus obtained might be of practical value, especially with studies of a similar curve showing the fatigue of convergence.

ALLING.

WEEKERS (53, **The astigmatics in the army**) says that the minimum visual requirements are practically the same in the Belgian as in the French army: ¼ for the better eye and $\frac{1}{10}$ for the poorer one. Weekers who is ophthalmic surgeon in the Belgian army found that a large percentage of the soldiers have astigmatism and need glasses to obtain the required visual acuity. He describes his way of keeping a good stock of glasses and says that the mostly needed combinations are cylinders, plus and minus, ranging from ½ to 3 D., combined with spheres, plus and minus, from 1 to 3 D.

SCHOENBERG.

VII.—THE MOTOR APPARATUS OF THE EYE.

56. GIFFORD, H. **A tension suture for advancement operations.** *Ophthalmic Record*, March, 1916.

57. HOFFMAN, F. L. **Miner's nystagmus.** *Annals of Ophthalmology*, July, 1916.

58. O'CONNER, R. **A new shortening technic.** *Journal of the American Medical Association*, July 22, 1916.

59. WEYMOUTH, F. W. **An experimental comparison of three methods of measuring heterophoria.** *Ophthalmic Record*, June, 1916.

60. WOOTTON, HERBERT WRIGHT. **Divergent concomitant strabismus, the muscular anomalies and refractive errors accompanying it, and its treatment.** *Ophthalmoscope*, May, 1916, p. 236.

WOOTTON (60, **Divergent concomitant strabismus, the muscular anomalies and refractive errors accompanying it, and its treatment**) says that while one muscle anomaly alone, convergence excess, may be the cause of convergent strabis-

mus, such is not the case in all instances of the divergent type. On account of lack of recognition of this, divergent strabismus is regarded by many as being more difficult to correct.

Wootton classifies divergent strabismus with muscular anomalies and refractive errors in order of frequency as they occur in New York City, in the following table:

1. Divergence excess: hypermetropia frequent; myopia rare.

2. Convergence insufficiency: myopia frequent; hypermetropia rare.

3. Divergence excess (marked) and convergence insufficiency: antimetropia frequent; bilateral myopia and bilateral hypermetropia less frequent.

Correction of the refraction produces no good effect when the deviation is due to divergence excess. The method of straightening the eye should be varied, and guided by the muscular anomaly present. In divergence excess advancement of internal recti is met with failure whether in hypermetropic or myopic eyes.

CURRAN.

GIFFORD (56, **A tension suture for advancement operations**) in advancing the external rectus passes a suture through the tendon of the internal rectus and then inserts one end through the edge of the upper lid between the middle and outer third and the other end through the corresponding point in the lower lid. Rotating the eye outward the suture is tied so that the lids are brought to the edge of the cornea and the eye forcibly fixed in position.

ALLING.

O'CONNER'S (58, **New shortening technic**) operation seems rather complicated. It consists in dividing the muscle into three bands, the outer being the narrower. He then loops catgut sutures about the outer bands and by drawing them produces loops in the tendon and shortening. The middle band is advanced by suturing it to the tendon stump. The effect may be graded by using catgut of different sizes as well as by the width of the outer bands. He has performed the operation forty-two times.

ALLING.

WEYMOUTH (59, **Three methods of measuring heterophoria**)

compared the Graefe test, the Maddox rod, and parallax by testing twelve individuals. The results show that these methods are surprisingly accurate and constant, especially if used with certain precautions such as a dark room and a uniform background. The variations from day to day were usually greater than the difference between the results by the various methods. It would seem that the Graefe test is the most consistent and the parallax test the most delicate. A combination of Maddox rod and parallax will increase accuracy.

ALLING.

HOFFMAN'S (57, **Miner's nystagmus**) paper is largely concerned with studies of the subject by foreign observers especially English. Statistics regarding this affection in the United States are limited as the question has never been thoroughly investigated. Various theories have been propounded to explain the cause of this trouble. It is supposed by some to be due to insufficient light in the mines. This seems to be highly probable, as the great majority of cases are found among miners who use the safety lamp which, at best, gives only faint illumination. Errors of refraction seem also to have an influence. Straining of the extrinsic muscles, especially the elevators, has been thought to be the cause, because the miner is often obliged to lie on his back and work with the eyes in a fixed and strained position. The neurotic element is another factor in the case and the trying character of the work is prone to exaggerate or engender such a condition. The more common use of machines and the working men's compensation laws have done much to improve the miner's lot and diminish this disease.

ALLING.

VIII.—THE LIDS.

61. ALTER, F. W. **Palpebral syphilis. A review with case report.** *Ophthalmology*, January, 1916.

62. LOEPER and CARLOTTIE. **Malignant pustule of the lid.** *Clinique ophtalmologique*, vii., 3.

63. ROBERTS, J. B. **A new muscle substitution operation for congenital ptosis.** *Ophthalmic Record*, August, 1916.

64. WESCOTT, C. **A case of granuloma pyogenicum affecting the eyelid.** *Journal of the American Medical Association*, June 24, 1916.

ROBERTS (63, **New operation for ptosis**) suggests the

following operation: he exposes the occipito-frontalis muscle by dissecting up a flap of skin on the forehead. A narrow vertical band of the muscle is turned down and fastened to the upper edge of the tarsal plate by undermining the skin of the superciliary ridge and lid.

ALLING.

ALTER (61, **Palpebral syphilis**) states that from 3% to 5% of extragenital primary lesions are of the eyelids. A large chronic lesion of the lids associated with enlarged preauricular and submaxillary glands requires investigation. Other conditions accompanied with enlarged glands are Parinaud's conjunctivitis, lupus, or tuberculosis, epithelioma, hordeolum interna, and acute processes such as gonorrheal conjunctivitis.

ALLING.

LOEPER and CARLOTTIE (62, **Malignant pustule of the lid**) report about a case of this nature which was speedily cured by a few deep incisions. The diagnosis was confirmed by a bacteriological examination.

SCHOENBERG.

The tumor described by WESCOTT (64, **Granuloma pyogenicum affecting the eyelid**) began like a sebaceous cyst at the edge of the lid. It became teat-like and assumed a dark red color growing through the skin which surrounded it like a collar. It was excised. These growths may simulate malignant tumors or chancre.

ALLING.

IX.—THE LACRIMAL ORGANS.

65. AUBINEAU, E. **Breaking the nasal canal for the cure of dacryocystitis.** *Archives d'ophtalmologie*, XXXV., 1.

66. POSEY, W. C. **Notes on a case of symmetrical lymphomata of the lacrimal and salivary glands (Mikulicz's disease).** *Ophthalmic Record*, June, 1916.

AUBINEAU (65, **Breaking of the nasal canal for the cure of dacryocystitis**) performs his operation for the relief of dacryocystitis by: (1) incising the skin and curetting the lacrimal sac and surrounding tissue; (2) breaking through the nasal duct with a strong curette; (3) draining the wound with gauze into the nasal cavity. General anæsthesia. Patient cured in fifteen days.

SCHOENBERG.

POSEY'S (66, **Symmetrical lymphomata of the lacrimal and salivary glands, or Mikulicz's disease**) patient was a colored woman of twenty-one who was tuberculous and syphilitic and had dental decay and alveolar involvement. The lacrimal, submaxillary, axillary, inguinal, and femoral glands were enlarged. The swelling of the lacrimal gland had been noticed only four weeks. In spite of the fact that the parotid was not involved a diagnosis of Mikulicz's disease was made.

ALLING.

MISCELLANEOUS NOTES

Our British confrères have amalgamated the three British ophthalmic journals, namely, *The Royal London Ophthalmic Hospital Reports*, *The Ophthalmic Review*, and *The Ophthalmoscope*,—into one journal, *The British Journal of Ophthalmology*, which will appear on January 1, 1917. This journal is controlled by a limited company whose shares are held by British oculists. The Directors are: Walter H. Jessop, Chairman, Sir Anderson Critchett, Sir George Berry, J. B. Story, Richardson Cross, Gray Clegg, W. Lang, H. J. Fisher, and Leslie Paton. The Editorial Committee consists of thirty members. E. Lawford is Chairman, Sydney Stephenson is Editor, and E. E. Henderson is Sub-editor. The annual subscription is £1.11.6.

The Annual Congress for 1917 of the Ophthalmological Society of the United Kingdom will be held in London on May 3d, 4th, and 5th, under the Presidency of Walter H. Jessop, F.R.C.S. The program is as follows:

Thursday, May 3rd: 10 A.M. to 12:30 P.M., Papers. 2:30 P.M. to 4:30 P.M., Visit to St. Dunstan's. Discussion on "Employment of the Blind," to be opened by Sir Arthur Pearson, Bart., Messrs. W. C. Rockliffe, H. Grimsdale, and A. Lawson. 5:30 P.M., Bowman Lecture, "On Colour Vision," by Sir George Berry, LL.D., M.D.

Friday, May 4th: 10 A.M. to 12:30 P.M., Visit to Hospitals. 3 P.M., Clinical Meeting at the Royal London Ophthalmic Hospital, City Road, E.C. 8:30 P.M., Papers.

Saturday, May 5th: 10 A.M. to 12:30 P.M., Discussion on "Concussion Injuries of the Visual Apparatus," to be opened by Mr. A. W. Ormond and Dr. S. A. Kinnier Wilson.